

Prediction of Compressive Strength of Concrete by Artificial Neural Network

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Abstract

In the competitive nature of construction, concrete has a versatile use in the construction practice. The compressive strength of concrete is mostly used criterion in producing concrete. However testing for compressive strength of concrete specimens is a complicated and time consuming task, more importantly it would be too late to alter if the test result does not satisfy the required strength, since the test is usually performed at the 28 day after the placement of concrete at the construction site, therefore accurate and realistic strength estimation before the placement of concrete is highly desirable. In our project we aim at predicting the compressive strength of concrete by artificial neural network technique (ANN). ANN is one among the artificial intelligence and also strong potential has a feasible tool for prediction. The basic methodology of neural network consists of three processes Network training, Testing, Implementation. In this network training is nothing but the learning method, there are many such learning methods. But here in our project we are using back propagation method for the prediction of compressive strength of concrete. This back propagation consists of input layer, hidden layer and output layer. The results were obtained for 1000, 10000 and 1 lakh epochs and minimum error was obtained for 10000 epochs with 10 numbers of neurons, hence the developed model could be proposed for decision making to analyze appropriate turnovers for a project using artificial neural network.

1. INTRODUCTION

Concrete has been used as construction material for more than a century. The property of concrete differs depending on various factors. The proportions of its constituents, the construction methods, the loading and environmental conditions to which it will be subjected over time are some of the issues that determine its strength. The concrete compressive strength is a complex non-linear regression problem for construction engineering. It is highly difficult to predict the concrete strength due to non-linearity. Concrete testing is performed in order to determine whether specified strength requirements are met. During this period of time concrete has undergone a continuous development. This unique quality makes concrete desirable as a building material because it can be molded to virtually any form or shape. The two major component of concrete are cement paste and inert materials the cement paste consists of Portland cement, water. In concrete mix design and quality control, the strength of concrete is a very important property. Compressive strength is the capacity of a material or structure to withstand loads tending to reduce size, opposed to tensile strength, which withstands loads tending to elongate. In other words, compressive strength resists compression (being pushed together), whereas tensile strength resists tension (being pulled apart). In the study of strength of materials, tensile strength, compressive strength, and shear strength can be analyzed independently. Compressive strength can be measured by plotting applied force against deformation in a testing machine, such as a universal testing machine. Some materials fracture at their compressive strength limit; Others deform irreversibly, so a given amount of deformation may be considered as the limit for compressive load. Compressive strength is a key value for design of structures. Compressive strength is often measured on a universal testing machine; Compressive strength is often measured on a universal testing machine, the compressive strength of concrete is related to mix proportions and mix preparation techniques, but the result of the compression test of a specimen can be influenced by the shape, dimension, and the boundary conditions of the specimen. Traditionally, concrete mix is designed based on previous experiences. The mixture design of concrete targets its 28th day compressive strength which is based on a standard uniaxial compression test and is accepted conventionally as a general index of concrete strength. Therefore accurate and realistic strength estimation before the placement of concrete is very important.

Conventional methods for predicting 28th day compressive strength of concrete are basically based upon statistical analyses, by which many linear and nonlinear regression equations have been constructed to model such prediction. Artificial neural network can be effectively adopted for predicting the compressive strength of concrete.

1.1 Artificial Neural Network

The history of neural networking arguably started in the late 1800s with scientific attempts to study the workings of the human brain. In 1890, William James published the first work about brain activity patterns; therefore the study of human brain is thousand years old.

Artificial Neural Networks success at system modeling for highly complex physical processes can be attributed to the original architecture on which they are based, the human brain. With the advent of modern electronics it was only natural to try harness this thinking process. The first step toward artificial neural network came in 1943 when Warren McCulloch, a neurophysiologist and a young mathematician Walter Pitts wrote a paper on how neurons might work; they moulded a simple neural network with electrical circuits. This model is broken into two parts a summation over weighted inputs and an output function of the sum. In 1951 Marvin Minsky created the first ANN while working at Princeton, Marvin Minsky did not think that minds are governed by a single general principle like neural learning or homeostasis.

ANN a paradigm for computation and knowledge representation is originally inspired by the understanding and abstraction of the biological structure of neurons and internal operation of the human brain. The biological brain consists of billions of highly interconnected neurons forming a neural network. Neural networks are a series of interconnected artificial neurons which are trained by using available data to understand the underlying pattern. They consist of series of layers with number of processing elements within each layer. The layer can be divided into input layer, hidden layer and output layer. Information is provided to the network through the input layer, the hidden layer processes the information by applying and adjusting the weights and biases and output layer gives output. Each layer will have a number of processing units called neurons. An activation function is then applied to weighted inputs to produce an output signal by transforming the input. The input can be single node or it may be multiple nodes depicting different parameters were each of input nodes acts as an input to the hidden layer. The hidden layer consists of number of neurons or nodes which calculate the weighted sum of input data. And all these processes are done by Neural Network toolbox.

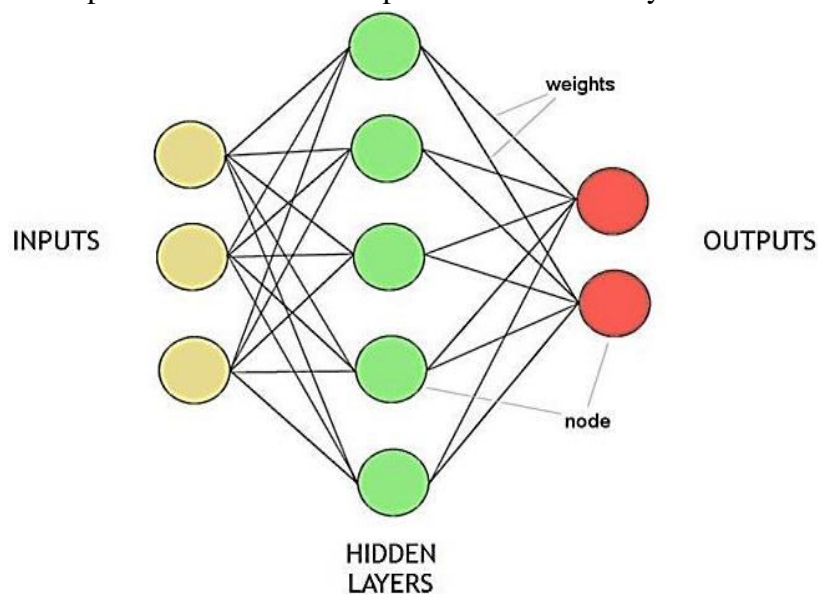


Figure 1: Structure on ANN model

The Neural Network Toolbox is one of the commonly used, powerful, commercially available software tools for the development and design of neural networks. The software is user-friendly, permits flexibility and convenience in interfacing with other toolboxes in the same environment to develop a full application. We do not view the Neural Network Toolbox as simply a summary of established procedures that are known to work well. Rather, we hope that it will be a useful tool for industry, education and research, a tool that will help users find what works and what doesn't, and a tool that will help develop and extend the field of neural networks. We can train a neural network to perform a particular function by adjusting the values of the connections (weights) between elements. Commonly neural networks are adjusted or trained, so that a particular input leads to a specific target output. Based on comparison of output and target, until the network output matches the target, typically many such input/target pairs are used, in this supervised learning, to train a network. Batch training of a network proceeds by making weight and bias changes based on an entire set (batch) of input vectors. Incremental training changes the weights and biases of a network as needed after presentation of each individual input vector.

1.2 Back Propagation

The Back propagation algorithm, originally discovered by Werbos in 1994 was rediscovered in 1986 with the book learning interval represented by error propagation by Runelhart, Hintor and Williams. Back propagation is a famous form of gradient descent algorithm used with artificial neural networks for minimization and curve fitting.

The great majority of the civil engineering application of neural networks is based on use of the Back Propagation algorithm primarily because of its simplicity. Training of a neural network with a supervised learning algorithm such as Back Propagation means finding the weights of the links connecting the nodes using a set of training examples. An error function in the form of the sum of the squares of the errors between the actual outputs from the training set and the computed outputs are minimized iteratively. The learning or training rule specifies how the weights are modified in each. In a back-propagation neural network, the learning algorithm has two phases. First, a training input pattern is presented to the network input layer. The network propagates the input pattern from layer to layer until the output pattern is generated by the output layer. If this pattern is different from the desired output, an error is calculated and then propagated backward through the network from the output layer to the input layer. The system first uses the input vector to produce its own output vector and then compares this with the desired output, or target vector.

2. EXPERIMENTAL PROCEDURE

2.1 Materials Used

Cement: Cement is most important ingredient of any type of concrete. It determines the strength and other properties of both fresh hardened state of concrete. Ordinary Portland

cement of 53 grade available in local market was used. The specific gravity was 3.12. The name was originated in a patent obtained by Joseph Aspdin of Leeds, England in 1824. Typical Portland cements are mixtures of tricalcium aluminate, dicalcium silicate and tricalcium silicate, in varying proportions, together with small amounts of magnesium and iron compounds. Gypsum is often added to slow the hardening process.

Coarse Aggregate: The coarse aggregate is the strongest component of concrete. Smaller particles of coarse aggregate fraction are likely to be stronger than larger ones. Crushed angular granite of 20 mm size from a local source was used as coarse aggregate. The value of specific gravity of coarse 2.6

Fine Aggregate: Fine aggregates with rounded particle shape and smooth texture have been found to require less mixing water. Sand particle should pack to give minimum void ratio, as higher void ratio leads to requirement of more water. Finally, sand should be free from deleterious materials like clay, silt content and chloride contamination etc. River sand available in local source comprising of zone-III was used as fine aggregate. The fine aggregate having specific gravity of 2.6.

Water: In concrete mix, the water requirement is reduced to the value required for hydration of cement, as excess water leads to formation of void in hardened cement paste phase of concrete. In general, water fit for drinking is fit for production of concrete. The salt content of water should also be limited, from point of view of its affect on initial hydration rate of cement, as this may lead to rapid loss of workability on account of higher amount of heat generated.

Table 1: Water cement ratios for different mix proportions

Grade	Water Cement Ratio			
M ₂₀	0.4	0.45	0.5	0.55
M ₂₅	0.4	0.45	0.5	
M ₃₀	0.4	0.45		
M ₃₅	0.4	0.45		
M ₄₀	0.4			

2.2 Concrete Mix Design

In this project we have designed mix for various water cement ratio and various grade of concrete ranging from M20 up to M40 as per IS 10262: 2009. Proportioning of a concrete mix comprises of determining the relative quantities of materials to be used in production of concrete for a given purpose. The process of selecting proportions of these materials is called "Concrete Mix Design" and should not be misunderstood with structural design. The process of mix design involves the consideration of properties and costs of ingredients. We have designed mixes for the following grade of concrete and water cement ratio:

- **Casting of cubes**

In the present paper, we propose a prediction model for concrete compressive strength using artificial neural networks. In the experimental part, 108 concrete samples with various water cement ratio were casted, after which their compressive strength at different age, viz. 7, 28 and 56 days.

- **Preparation of concrete specimens**

Concrete was made in a laboratory mixer. Cubic concrete samples (150X150mm) were made and examined. Casting was performed at a vibrating table until a complete consolidation was achieved.

- **Test procedure**

After the concrete was casted in metal moulds, samples were left at room temperature ($27 \pm 2^\circ\text{C}$). Concrete samples were demoulded after 24 hrs. and soaked in water for the next six days. At the seventh day, compressive strength was determined by using UTM.

2.3 Working with ANN

Designing of ANN models: Designing ANN models follows a number of systemic procedures. In general, there are five basic steps:

- Collecting data
- Pre- Processing data
- Building the network
- Train
- Test performance of model.

Collecting and preparing sample data is the first step in designing ANN models. The data were divided into data for training and testing the neural network. The training patterns were randomly input into the network.

- 70% of total data for training of the neural network
- 15% of total data for validation of the neural network
- 15% of total data for testing of the neural network

The input data are entered in the software, the data are - Quantity of cement, Course aggregate, Fine aggregate, Water and Water cement ratio. As required by the software the values entered should be in the range of -1 to +1, therefore all the values are divided by the greatest value. The input and their target is given.

After data collection, three data pre-processing procedures are conducted to train the ANN more efficiently. These procedures are: Solve the problem of missing data, Normalize data and Randomize data. The missing data are replaced by the average of neighbouring values. Normalization procedure before presenting the input data to the network is generally a good practice, since mixing variables with large magnitudes and small magnitudes will confuse the learning algorithm on the importance of each variable and may force it to finally reject the variable with the smaller magnitude.

After pre-processing the next step is building the network. At this stage, the designer specifies the number of hidden layers, neurons in each layer, transfer function in each layer, training function, weight/bias learning function, and performance function. In this work, multilayer preceptor (MLP) is used. Neural network is like brain full of neurons and made of different layers. The first layer which takes input and put into internal layers or hidden layers are known as input layer. The outer layer which takes the output from inner layers and gives it to outer world is known as output layer. Transfer function used is TANSIG. The function TANSIG generates the values from +1 to -1. Training function which we used is TRAINLM. The fastest training function is generally TRAINLM, and it is the default training function for feed-forward net. The back prop weight/bias learning function default is LEARNM. LEARNM is the Grad. Descent w/momentum weight/bias learning function. The back prop weight/biased the default performance function is mse. Mean square error function is the performance function that calculates the average squared error between the networks outputs and the target outputs. Back propagation is commonly applied to feed-forward multilayer networks. After building the network it is trained. During training certain stopping criteria are used in order to stop the network at certain level at which the regression plot is accurate.

Table 2: Criteria used to stop network training

Parameter	Stopping criteria
min_grad	Minimum Gradient Magnitude
max_fail	Maximum Number of Validation Increases
time	Maximum Training Time
goal	Minimum Performance Value
epoch	Maximum Number of Training Epochs (Iterations)

3. RESULTS AND DISCUSSION

Table 3: Properties of ANN Model

Training Function	TRAINLM
Learning Function	LEARNM
Performance Function	Mean Square Error (MSE)
Transfer Function	TANSIG

Table 4: Range of input parameters in Database

Input parameters	Minimum	Maximum
Cement Content (kg/ m ³)	300	340
Fine Aggregate Content (kg/m ³)	729.17	774.60
Coarse Aggregate Content (kg/m ³)	1189.70	1263.80
Water Cement Ratio	0.40	0.55

3.1 Network Training with 1,000 Epochs

The network is showing a least result of 93.20% when it is simulated by input of 75 test results with randomly selected 33 test results for 10, 20, 30, 100, 150, 200, 250 and 300 numbers of neurons used in training process. Here while we compare a result got from ANN network with the actual results, 6 results were found to be having more than 10% error and 15 results were having less than 5% error. Therefore the results which we were expecting is low compare to the results we got from the analysis. The graph plotted for number of neurons v/s percentage errors is shown below in Fig. (2).

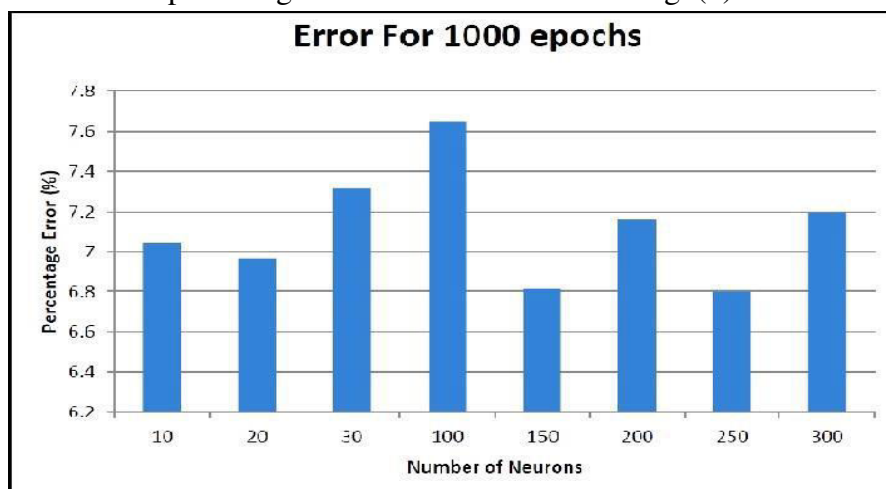


Figure 2: Error for 1000 epoch

3.2 Network Training with 11akh Epochs

The network is showing a least result of 93.17% when it is simulated by input of 75 test results with randomly selected 33test results for 10, 20, 30, 100, 150, 200, 250 and 300 numbers of neurons used in training process. Here while we compare a result got from ANN network with the actual results, 5 results were found to be having more than 10% error and 15 results were having less than 5% error. Therefore the results which we were expecting is low compare to the results we got from the analysis. The graph plotted for number of neurons v/s percentage errors is shown below in Fig. (3)

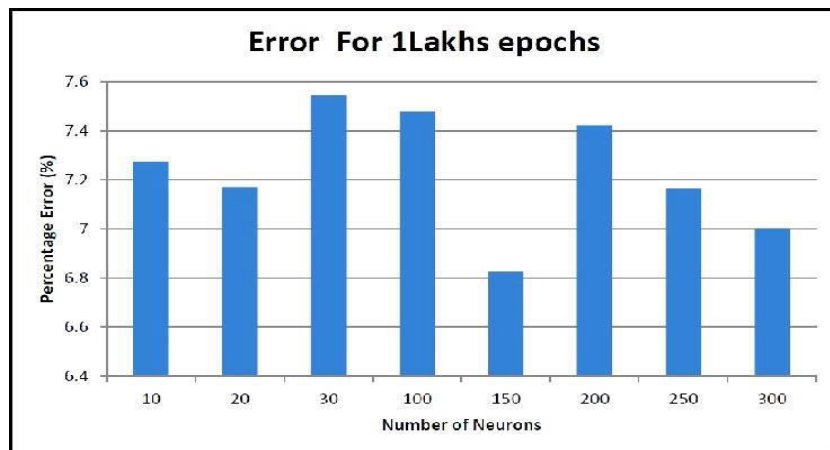


Figure 3: Error for 1Lakh epoch

3.3 Network Training with 10,000 Epochs

The network is showing a least result of 94.43% when it is simulated by input of 75 test results with randomly selected 33 test results for 10, 20, 30, 100, 150, 200, 250 and 300 numbers of neurons used in training process. Here while we compare a result got from ANN network with the actual results, only 2 results were found to be having more than 10% error and 21 results were having less than 5% error.

Therefore the expected results are almost near to the results we got from the analysis. When the network of 10000 epochs is trained and simulated with 10 neurons it showing a peak result of 94.83% which is a makeable result in its kind. The graph plotted for number of neurons v/s percentage errors is shown below in Fig. (4)

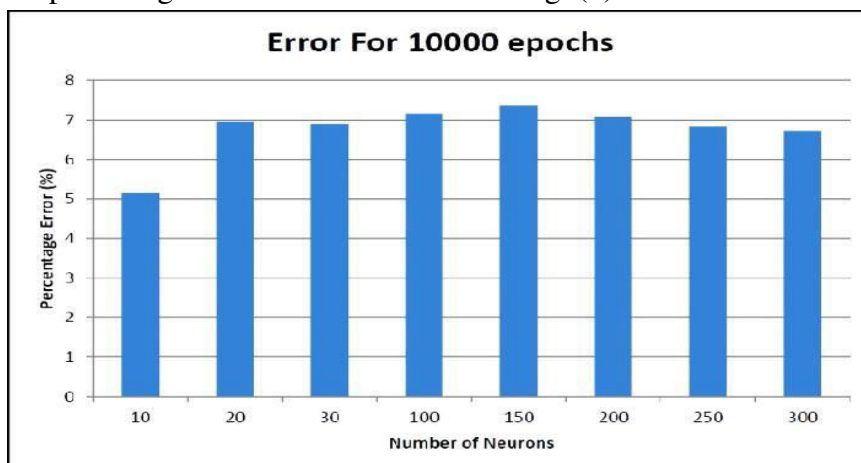


Figure 4: Error for 10000 epochs

While carefully observing the above plotted graphs, Fig. (5) it can be analyzed that only the results obtained from test of 10000 epochs were feasible. It was showing 94.83% accuracy when it is trained with 10 numbers of neurons. There is also a better accuracy of 93.20% got from 250 numbers of neurons trained with 1000 epochs and accuracy of 93.17% from 150 numbers of neurons with 1 Lakh epochs. Hence, it is showing the developed model could be proposed for decision making to analyze appropriate turnovers

for a project using Artificial Neural Networks by studying the importance of various factors so as to aid the contractors in decision making.

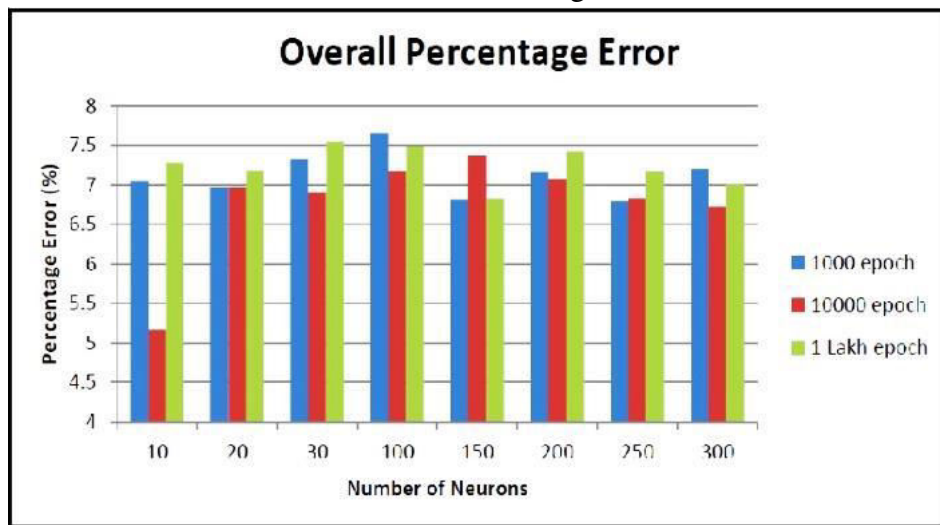


Figure 5: Overall percentage error

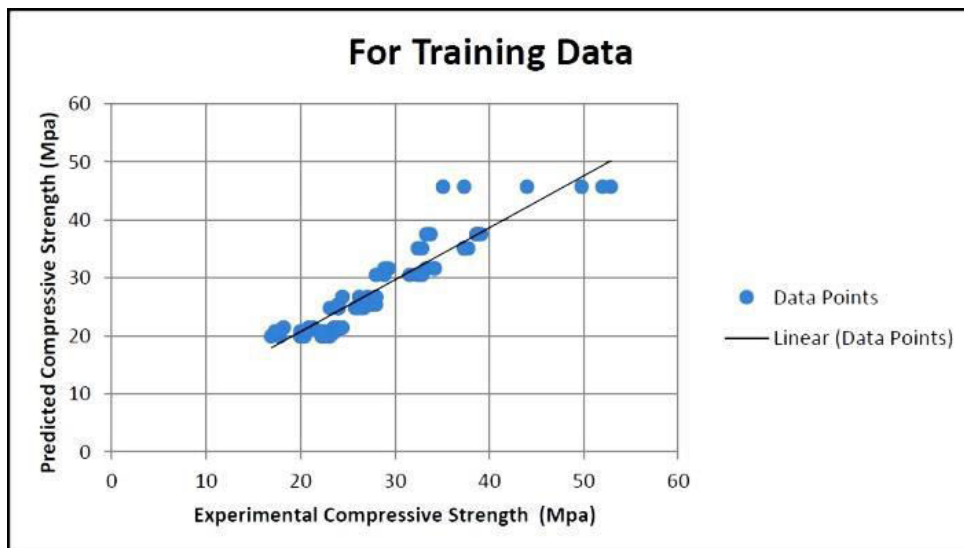


Figure 6: Actual and predicted compressive strength of regression for training data

The above plotted graph Fig. (6) Shows Actual and predicted compressive strength of regression for training data. From Table (5). The maximum errors for 33 samples are about 12.93%, on the other hand, it can be seen that 55% of the output results has errors less than 5%. The performance of a trained network can be measured to some extent by the errors on the training sets, but it is often useful to investigate the network response in more detail. One option is to perform a regression analysis between the network response and the corresponding targets and finding a correlation coefficient. It is a measure of how well the variation in output is explained by the targets. If this number is equal to 1, then there is perfect correlation between targets and outputs predictions.

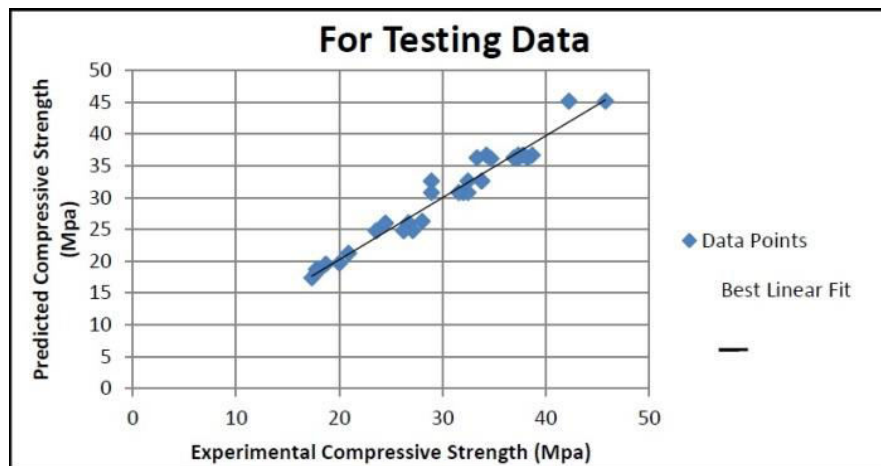


Figure 7: Actual and predicted compressive strength of regression for testing data

The above shown graph Fig. (7) Shows a plot of actual compressive strength against corresponding ANN predictions for testing data. A linear correlation can be observed and the correlation coefficient is found to be 0.965. Thus it can be concluded that the model successfully predicted the compressive strength of concrete in good manner. Because of the weight of the back propagation network cannot be easily understood in the form of a numeric matrix, they may be transformed into coding values in the form of a percentage by dividing the weights by the sum for all the input parameters, which gives the relative importance for each input parameter to output parameter.

4. CONCLUSION

The first known knowledge about neural networks dates from the year 1940, but their practical application began 40 years later. These days there are many research works and continuous interest in neural networks, and they are the subject of studying on many universities worldwide. Neural networks found their practical application in different areas and are used as a method for solving many difficult and complex problems.

This paper presents a non-traditional approach to the prediction of compressive strength of a cement paste mixture, based on ANN technology. Based on the findings of this investigation, the following conclusions can be drawn:

- I. The model is used successfully for predicting the compressive strength of concrete. The test of the model by un-used data within the range of input parameters shows that the maximum percentage of error is 12.93. on an average error for 33 samples is 4.38 which is acceptable
- II. In constructing, early determination of compressive strength value is very important. Normally, determination of compressive strength takes 28 days but using the proposed ANN model, the compressive strength value can be predicted in shorter time.
- III. ANN has been trained with about 70% of the total data sets being used as input and tested with about 30% of the total data sets being used as sample. The ANN model performs sufficiently in the estimation of concrete compressive strength and predicted value are in good agreement with those of the experimental values.

- IV. The proposed technique can be used as a useful tool for reducing the duration of the project execution in huge civil project.
- V. Leven berg-Marquardt algorithm has been used for feed-forward back-propagation. ANN models have been developed by using MATLAB software for training and prediction compressive strength.
- VI. The prediction made using ANN shows a high degree of consistency with experimentally evaluated compressive strength of concrete specimens used. Therefore, the present study suggests an alternative approach of compressive strength assessment against destructive testing methods.
- VII. Although the prediction capability of any ANN model is limited to data located within the boundaries of the training range, the proposed model can be retrained to include a wider range of input variables by providing additional training sets.
- VIII. The model could be useful in reducing the number of trial mixes, reducing labor, financial expenditure, and time.

5. REFERENCES

- [1] Dr. Salim T. Yousif, Salwa M. Abdullah, Civil Eng. Dept. -University of Mosul, "Artificial Neural Network Model for Predicting Compressive Strength of Concrete", Tikrit Journal of Eng. Sciences/Vol.16/No.3/September 2009,pp-55-66
- [2] M. F.M. Zain and S. M. Abd, 2009. Multiple Regression Model for Compressive Strength Prediction of High Performance Concrete, Journal of Applied Sciences, 9: 155-160.
- [3] Vahid. K. Alilou& Mohammad. Teshnehlab, August 2009" Prediction of 28-day compressive strength of concrete on the third day using artificial neural networks", International Journal of Engineering (IJE), Volume (3) : Issue (6) pp 565-576.
- [4] Karna, K. N. and Breen, D. M. (1989), "An artificial neural networks tutorial: Part 1 – basics", The international journal of neural networks, 1(1), pp.4-23
- [5] Guang, N.H. and Zong, W.J. , " Prediction of compressive strength of concrete by neural Networks", Cement and Concrete Research, 30(8), 2000, pp. 1245-1250.
- [6] C. Deepa, K. Sathiya Kumari and V. Pream Sudha, September 2010,"Prediction of the Compressive Strength of High Performance Concrete Mix using Tree Based Modeling", International Journal of Computer Applications (0975 – 8887) Volume 6– No.5, September 2010,pp 18-24
- [7] Rumelhart, D. E., Hinton, G. E. and Williams, R. J. (1986), "Learning internal representations by error propagation", In: D. E. Rumelhart & J. L. Mclelland, Eds., Parallel Distributed Processing, 1, Chapter 8, Reprinted in Anderson & Rosenfeld[1988], pp675-695.
- [8] Adeli, H. & Hung, S. L , machine learning – neural networks ,Back propagation, genetic algorithm and Fuzzy systems,"johnwiley and sons". Inc, Newyork 1995.
- [9] Insung Jung, and Gi-Nam Wang,2007,"Pattern Classification of Back-Propagation Algorithm Using Exclusive Connecting Network "World Academy of Science, Engineering and Technology International Journal of Electrical, Computer, Energetic, Electronic and Communication Engineering Vol:1, No:12, 2007
- [10] Sakshi Gupta ,National Institute of Technology, June 2013" Concrete Mix Design Using Artificial Neural Network", Journal on Today's Ideas – Tomorrow's Technologies (JOTITT), Volume 1, Number 1.June 2013,pp. 29–43
- [11] Maitha H. Al Shamisi, Ali H. Assi and Hassan A. N. Hejase (2011). Using MATLAB to Develop Artificial Neural Network Models for Predicting Global Solar Radiation in Al Ain City –



UAE, Engineering Education and Research Using MATLAB, Dr. Ali Assi (Ed.), ISBN: 978-953-307-656-0

[12] E. Rasa, H. Ketabchi, M. H. Afshar. "Predicting Density and Compressive Strength of Concrete Cement Paste Containing Silica Fume Using Artificial Neural Networks". ScientiaIranica, 16(1):32-42, 2009

[13] Mohamed A. Shahin, Mark B. Jaksa And Holger R. Maier, Department Of Civil And Environmental Engineering, Adelaide University March 2001, "Artificial Neural Network Applications In Geotechnical Engineering" Australian Geomechanics – March 2001, Pp 49-62.

[14] Rama Mohan Rao.P , H.Sudarsana Rao , "Prediction Of Compressive Strength Of Concrete With Different Aggregate Binder Ratio Using ANN Model", International Journal of Engineering Research & Technology (IJERT), Vol. 1 Issue 10, December- 2012, ISSN: 2278-0181.

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Detection Of A Node In Promiscuous Mode In A Subnet

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Abstract

A packet is a part of a message which is broken down into pieces. A packet sniffer is a program which sniffs or looks at packets which is sent over a network. it can see all the information which is passed over a network. A computer normally looks at a packet addressed to it and ignores the other packets on the network. But when it is set in promiscuous mode it can view all the packets in the given subnet. In this paper, a cryptographic hash function maps the data in the packet with a unique digest for the data. A digest is that which is generated when a data is passed to a cryptographic hash function. The source node generates the original digest. The source and the destination nodes contain the original digest in their hash tables. If any intermediate node between the source and the destination is in promiscuous mode, the original digest is modified by passing this digest generated at the source node into cryptographic hash function present at this node. This generates a new digest and hence the existing digest which was generated at the source is modified. When the destination node learns that the original digest is modified, it discards this packet. It further routes this packet through a different route to avoid the packet from being sniffed.

1. INTRODUCTION

A node in network may be any computer which is connected to the given network. Generally, a node in a network only addresses those packets which contain the destination address of given node. To be more precise, it must contain the MAC address of the given node in the packet in order for the given node to respond to the packet. This is called the normal mode. Generally, packet filtering is done by the NIC (Network Interface Card). When a NIC receives all those packets which are not addressed to it, it is said to be in promiscuous mode. In this case the packet filtering is not done by the NIC but is passed to the system kernel.

A packet analyser (also called network analyser, protocol analyser or packet sniffer) is a computer program or a piece of computer hardware that can intercept a traffic passing over a digital network when set in promiscuous mode. As the data streams across the network, it captures each packet and can decode the packet's raw data. A packet sniffer can be run only in a given subnet. A packet sniffer can be of two types:

1. Unfiltered - captures all the packets.
2. Filtered - captures packets which contain only specific data elements.

A sniffer which is running on one of the ISPs or a node would be able to monitor the following on line activities of the user such as:

- The Websites visited.
- The content viewed by the user in these websites.
- The emails sent by the user.
- The content that a user downloads from a website.
- Various streaming events that the user may use such as audio, video and Internet telephony.
- Protocols such as telnet and FTP often transmit data and passwords in clear texts which can be analysed using such sniffers. These protocols do not have encryption techniques to secure the data transmitted. [1]
- Wireless networks whose access points use WEP (Wired Equivalent Protocol) as native securities can be easily broken when a NIC is set in promiscuous mode by capturing vital information. [1]

Besides the malicious activities which can be done using a packet sniffer, there are also advantageous in the following cases:

- Analysis of network problems.
- Misuse of network by internal and external users.
- Helpful in monitoring WAN bandwidth utilization.
- A Reverse engineer may use it to implement a proprietary protocol over a network.
- It may be used to determine the effectiveness of firewalls, web filters, Spam filters, proxies etc.
- As a tool for routine network management system.
- Debugging client – server communications and network protocol communications.

Some of the commonly used packet analysers are as follows:

- Network Analyser.
- Carnivore (A tool used by FBI).
- Microsoft Network Monitor.
- TCP dump.
- Wireshark (formerly known as Ethereal).

2. EXISTING METHODS TO DETECT A NODE IN PROMISCUOUS MODE

Since sniffing a packet in the network often does not interfere with the network traffic, it is often difficult to detect a node in promiscuous mode. Although there are no effective methods to detect a promiscuous node some of them are mention below:

- Using firewalls to block ICMP traffic – A given node can ping using a right IP address and wrong MAC address (Modified MAC address). Often a node in normal mode will reject any frame addressed to it and the IP stack will not respond to it but a node in promiscuous mode will allow the frame to be passed to it and IP stack responds to it as with any other ping. This can be prevented by configuring the firewall settings and blocking ICMP(Internet Control Message Protocol) traffic.
- Using multi-cast packets – In this technique we send multi-cast packet to the nodes in the network. When a pack is in normal mode, if it's hardware address is not registered in the multi-cast list, it will reject this packet. But if a packet is in promiscuous mode, such packets will pass the hardware filter even if the hardware address in not registered in the multi-cast list. In this case the software filter also does not reject such packets and hence its response is seen for such packets. Hence in this case the promiscuous node can be detected. There are few exceptions for this case some old NICs do not support multi-cast list. In some cases, as in 3COM NIC, by default they are set to multi-cast mode. In such cases this method cannot be employed. [2]
- Using group bits packets – These are the packets which the group bits set. In normal mode, the hardware filter rejects such packets but in promiscuous mode these packets surpass the hardware filter and the software filter categorizes them as multicast packets. Hence they also pass the software filter. Hence such packets can be used in the detection of promiscuous modes. A typical group bit address is 01-00-00-00-00-00. [2]
- Using ARP packets – In this technique we use ARP (Address Resolution Protocol) packets to detect a node in promiscuous mode. When a node is in promiscuous mode, filtering of packets is done by the system kernel contrary to that of a normal mode where a packet is filtered by the NIC. In this method a custom ARP packet is composed by the user by setting the Hardware address of the destination node of the packet with 00 00 00 00 00 00 (an address used to denote an unknown destination) and is sent in the given network from the source node. Normally a node in normal mode will respond to a packet for which the hardware address is addressed to it. Since a node in normal mode cannot have an unknown addressed,

it does not respond to this ARP packet request. But a node in promiscuous mode will respond to this as hardware filter is often bypassed and filtering is done by the software filter. Hence the node responds to the ARP request for this packet by sending a response. We understand here that we have set the destination node to some unknown address and since there is a response to this packet, we conclude that the response is from a node set in promiscuous mode. [2]

- In a Linux OS, a simple way to detect a promiscuous node is use the command 'ifconfig -a' and if any of the network interfaces is attributed with PROMISC flag. Then it is obvious that the given node is in promiscuous mode. [2] Sometimes this may fail in IPV6 (Internet Protocol Version 6) interfaces as promiscuous flags are handled differently. [3]
- Using tools such as kstat, ifstat and running open source C programs such as cpm.c(may not work in a IPV6). [3]

3. PROPOSED SYSTEM

The components of our system are as follows:

- Cryptographic Hash function.
- Source Node.
- Destination Node.
- Intermediate Node (in promiscuous mode).

I. Cryptographic Hash Function

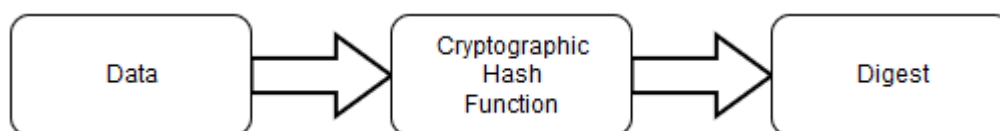


Figure 3.1: Cryptographic Hash Function

A cryptographic hash function is a hash function in which it is impossible to retrieve the data from the hash value. The input value to this function is called message and the hash value generated is called message digest or simply digest. It has the following properties:

- It is easy to compute the hash value for any given message.
- It is not possible to modify the message without modifying the hash.
- It is not possible to find two different messages with the same hash value.
- It is infeasible to construct the message from the hash function.

Some of the common cryptographic hash functions are as follows:

- MD4 (128 bit).
- MD5 (128bit).
- RIPEMD (160 bit).
- SHA-1 (160 bit)
- SHA – 256, SHA – 384, SHA – 512

The cryptographic hash function is the core component of this system. It generates a unique digest for the data present in the packet and inserts this into the packet.

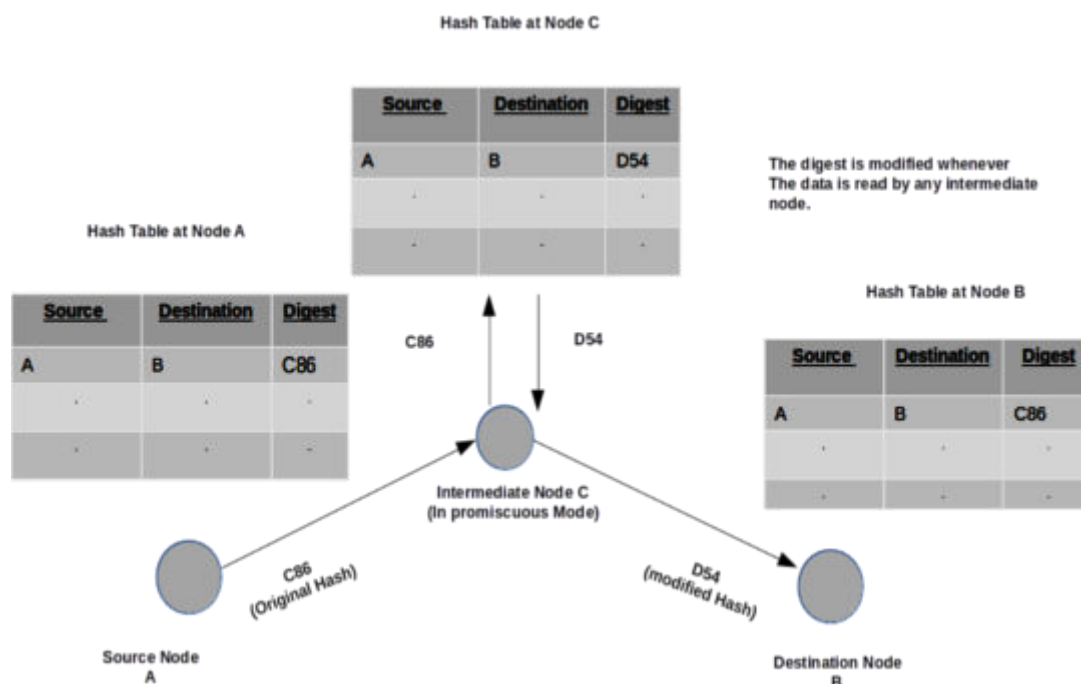


Figure 3.2: Figure depicting the functioning of the Cryptographic Hash Function

The source and the destination nodes contain this original digest which is maintained in the form of a hash table. The hash table contains the source node, destination node and the digest. In the above example which is depicted in the fig.2. The digest for the data is C86 at both the source node A and the destination node B. Although the digest may be much longer than that shown in the diagram. We have used the digest C86 for illustration purpose. Both the source and the destination nodes maintain the same digest in their hash tables. When any intermediate in promiscuous mode is encountered, this data packet has to be passed to this node. When this node tries to read the data in the packet. The already existing digest generated at the source node is passed to the cryptographic hash function present at this node on exit of the packet. Hence the hash function maps this digests C86 (since this is considered as the new data for the hash function) to generate a new hash D54.

II. Source Node

The source node is the node from which a packet is being sent. Before the data is inserted into the packet, we use a cryptographic hash function to map data to a unique digest. The digest is stored in the Source's node hash table.

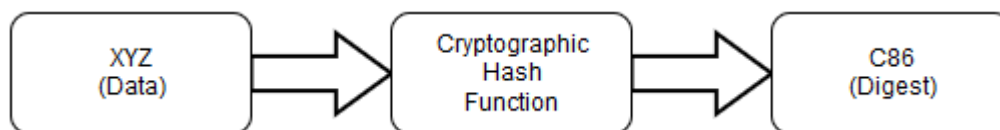


Figure 3.2: Digest generation using the cryptographic hash function at the source node.

The data is then inserted into the packet and is sent to the destination node. This cryptographic hash function is present at all the nodes in the given network. A unique digest is created only at the source node. Thereafter if any node reads this packet, this existing digest is mapped to another unique digest using cryptographic hash function. This causes the digest to change drastically since the data value is changed (Avalanche effect). But the digest maintained in the hash tables by the source and the destination nodes remains unchanged.

3.3 Intermediate Node

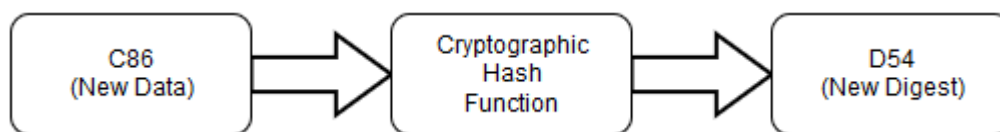


Figure 3.3: Modification of digest at the intermediate node in promiscuous mode.

We assume here that there is an intermediate node in promiscuous mode (in the example Node C). This node reads all the packets on the given subnet even if the given packet is not addressed to it as the node is promiscuous mode. When this node tries reading the packet which is addressed to some other node, the existing digest is passed to the cryptographic hash function present in this node on exit to change the digest. By the property of a cryptographic hash function, change in the data changes the digest by a large value (avalanche effect). Hence this is mapped to a new digest. In the above example, the packet is addressed to the destination node D, C is the intermediate node which is promiscuous mode. The cryptographic hash function on this node maps the existing digest (C86) to a new digest. Hence we notice that the digest changes to D54 at the intermediate node C.

3.4 Destination Node

The destination node is the one to which a given packet is addressed to from the source node. The destination node also maintains a hash table which contains the the digest generated at the source node and the address of the source node. When the destination node receives the packet, it cryptographic hash function first checks the digest in the packet with digest maintained in its hash table. If the digest is the same then it accepts the packet. Otherwise, it discards the packet. In this case there is change in the digest. (fig. 2.) We notice that the received packet contains a digest value of D54 but the original digest which was generated at the source node was C86. Since there is change in the Digest value this node discards this packet.

It further modifies its routing table and tries to locate any other nearest node. On finding a suitable node through which it can receive packets from the same source node, it now updates its routing table to receive packets through this newly located node form a new route. Hence receiving packets through a route which contains a node in promiscuous mode is avoided.

4. CONCLUSION

The existing methods for the detection of node in promiscuous mode are not always effective in all networks and protocols. Further there are not many methods to detect such nodes. We have tried to devise a generalized method to detect promiscuous nodes. This is the reason why we have not selected a particular cryptographic hash function such as SHA-1 or MD5 to name a few. This advantage of using this method is as follows:

- The overhead in the packet is reduced since only the digest is sent. In cases where the data is significantly large, mapping them to digest reduces the bandwidth consumed to transmit the functions. Some cryptographic hash functions are of constant length which is added advantage for the network traffic system to manage the traffic effectively.
- We observe that the data is not directly transmitted it is mapped to a digest and then transmitted. Even if a node were to be in promiscuous mode it may not recover the data from the digest as only the source and the destination node's cryptographic hash function are devised to retrieve the data.
- Once the destination node learns that there is node in the subnet which is trying to read packets flowing the network. These packets can be routed to different route. Hence further packet sniffing in the network is avoided.

5. REFERENCES

- [1] Sniffin' the ether v2.0, <http://unixgeeks.org/security/newbie/security/sniffer/sniffer.html>, visited on 29/4/2016
- [2] Detection of Promiscuous Nodes using ARP packets, <https://www.ihatefeds.com/promiscuous.pdf>, visited on 29/4/2016
- [3] Basic Packet Sniffer Construction from the Ground Up, https://packetstormsecurity.com/files/14414/Sniffer_construction.txt.htm, visited on 28/4/2016
- [4] Cryptographic Hash Function, https://en.wikipedia.org/wiki/Cryptographic_hash_function, visited on 29/4/2016
- [5] Detecting a packet sniffer on a IPV6-enabled Linux system, <http://www.la-samhna.de/library/sniffer.html>, visited on 29/4/2016
- [6] William Stallings, Network Security essentials: applications and standards (3rd Edition), Pearson Education India

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Body Mass Index, Blood Pressure And Personality: A Correlational Study Of Adults

Paper ID	IJIFR/V3/ E9/ 040	Page No.	3405-3411	Subject Area	Psychology
KeyWords	Body Mass Index, Systolic & Diastolic Blood Pressure , 16PF, Positive & Negative Correlations, Personality Based Somatic Constitution , Rohtak & Mahindergarh Districts, Non-Random Purposive & Volunteered Sampling Procedure, 200 Participants,				

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Abstract

In the present work an attempt has been made to study the relationship between BMI, blood pressure and personality. Body Mass Index, blood pressure and 16PF were measured for 200 participants. Mean age of the sample was 28.75 years. The obtained scores were analyzed by applying Pearson Product moment method of correlation by IBM SPSS Statistics version 21. Results of the study showed that there were positive as well as negative correlations between the somatic constitution and personality, systolic and diastolic blood pressure also had positive and significant correlations.

1. INTRODUCTION

Obesity is a global issue of epidemic proportion. The World Health Organization [WHO] (2011) reports in 2008, 500 million adults were obese and by 2015 this number is anticipated to reach 700 million. Obesity is defined as a body mass index over 30 or “excessive fat accumulation” (WHO, 2011). Obesity reduces an individual’s life expectancy between 5 to 20 years (Olshansky et al., 2005) and is as deleterious as heavy smoking (Neovius, Sundstron, & Rasmussen, 2009). Moreover, it significantly increases a person’s risk of developing coronary heart disease, stroke, type 2 diabetes mellitus, and cancer (Center for Disease Control, 2008). Obesity is attributable to over 110,000 deaths

annually in the United States (Flegal, Graubard, Williamson, & Gail, 2005). Today the obesity threatens the health of more than half the citizens of the richest nation, in the world. The idea that personality is co-related with body build was introduced in the 1920's and further refined in 1940's. Three body types were described; endomorph (pyknic), mesomorph (athletic) and ectomorph (aesthetic) (Sheldon, Stevens and Tucker, 1941). The term endomorph denoted around, soft body frequently associated with an affectionate. The athletic mesomorph was one of the average sizes with the muscular built who preferred physical activity, courage ruthless and indifferences in pain. Finally ectomorph was a tall, thin fragile person etc. This system of body "summarize individuals- correlating personality and body build- is not universally accepted. The component of a person's body structure determines expectations about the person's abilities and greatly influences what the person can do.

A person's physical dimension affects emotions, intellectual functioning, social experience and even spirituality. Physical fitness is associated with an improved self-image positive attitude, self-confidence, a decreased number of periods of depression, greater ability to relate to other people, increased assertiveness and an increased number of spiritual experiences (Beck, Rawalins and Williams, 1984).

Several indexes of overweight and obesity are based on weight and height. A person's relative weight is determined by their actual weight by their ideal weight would have a relative weight of 1.0. A person with a relative weight of 1.17 would be 17% overweight. A person with a relative weight of 0.90 would be 10% below ideal weight for height (Bray 1984). Research has clearly demonstrated that obesity is associated with high cholesterol level and the development of hypertension, coronary heart diseases, diabetes and cancer (AHA, 2000, Calle et al 1999, Chan et al 1994, Ford, 1999, Jeffery, 1991-92 Must et al 1999).

Being obese presents disadvantages to the person's health and social relationship in childhood (Bray, 1984). Excessive under or overweight is hazardous to health, equally hazardous is weight cycling, a pattern of repeated weight gain and loss. An ongoing study of Harvard alumni has reported that men who maintained a stabled weight had significantly lower death rates from all causes (including cardio vascular diseases) then did alumni who had either gained as a significant amount of weight over the years (Lee Hsichs and Paffebarger, 1995).

Various ratios of weight to height have also been studied. The most commonly used ratio is the body mass index (BMI), also known as the quetlet index. BMI is derived from a mathematical formula based on equals weight in kilograms divided by height in meters squared ($BMI = \text{Kg.} / \text{M}^2$). BMI lower than 18.5 is considered underweight, where 18.5- 24.9 as normal from 25.0-29.9 as overweight 30.0 and above obese (Kaplan, Sallis and Patterson, 1993). High BMI leads to many physiological and psychological problems such as body pain, high blood pressure, laziness, anxiety, distress etc. High blood pressure is very much linked with high BMI. (Pronk, Tand and Connor, 1999) reported that high

body mass index (BMI), low physical fitness and great willingness to communicate were directly and significantly associated with higher health care costs.

Research on personality and obesity reveals a complex relationship. Obese individuals tend to be more impulsive, addictive, anxious, and novelty seeking than healthy weight counterparts even after controlling for treatment seeking behavior and binge eating disorder (Davis et al., 2008; Sullivan, Cloninger, Przybeck, & Klein, 2007). Treatment seeking behavior is associated with increased cooperativeness and reward dependence, while non-treatment seeking individuals tend to score lower on measures of persistence and self-directedness (Sullivan et al., 2007). Novelty seeking is key in intervention outcome and is negatively associated with successful weight loss after 22 weeks of treatment (Sullivan et al., 2007). A period of two years of successful weight loss is associated with changes in personality traits with significant reductions in measures of anxiety (Ryden et al., 2004). Although numerous statistically significant personality differences have been identified between obese and non-obese populations, effects sizes are small to moderate and do not suggest an obese personality profile (Ryden et al., 2003). Rather, individual personality traits are related to a dynamic combination of weight status, treatment seeking behavior, co morbidities, and intervention success (Ryden et al., 2003; Ryden, et al., 2004),(Valenti,etal 2011) .Personality characteristics are assumed to underlie health behaviors and thus a variety of health outcomes (Larsen Geen et al., 2004). (Kakizaki, Kuriyama, Sato et al., 2008) found that in men and women extroversion and psychoticism had an inverse association. Lie had an inverse association with overweight in men. In men and women, only extraversion had an inverse association with underweight and neuroticism had a quality association with underweight.

Systolic as well as diastolic blood pressure also influenced by personality. high blood pressure (BP) is lead to a psycho physiological disorder i.e. hypertension and the main problem linked with it is its risk potential.

Since in most cases no symptoms are noticeable over long periods, the disease often is well established before treatment is initiated. It therefore, is also known as the silent killer as people may go on for years without knowing its presence organically. Irvine, Garner, Logan (1989) found that personality factors are not a fundamental characteristic of hypertension but reflect the influence of exposure to medical attention or knowledge of hypertension. Personality characteristics such as anxiety and anger have long been associated with essential hypertension. (Waal-Manning, Knight, Speras and Jaulin,1986) found that blood pressure was moderately correlated with age and Quetelet Index, a measure of obesity. (Kohler,Speier U and Richter, R.,1994) reported that emotionality traits showed any correlation with blood pressure value score of the whole sample.

In the light of above indications body mass index seems to be much associated with personality. Having inconsistent findings, the present study is an attempt to study the effect of somatic constitution on personality. It is hypothesized that deviant BMI would be associated with personality. Deviance would also affect the perceived weight status and its management.

2. METHODOLOGY

2.1 Sample: The sample comprised of 200 educated adults who were selected mainly from Rohtak and Mahindergarh districts of Haryana on the basis of non-random purposive and volunteered sampling procedure. Mean age of the sample was 28.75 years.

2.2 Tools: The following tools were used:-

- **Body mass index:** A measure of physique: Height and weight of the subject was taken for the purpose of the BMI calculation standard metric scale and weighing machine was used. The index was scaled as popularly and accepted notion (Levinthal, 1990)

$$\text{BMI} = \frac{\text{Weight (Kg.)}}{\text{Height M}^2}$$

- **16 personality factor:** - The sixteen- personality factor questionnaire (16 PE) is an objective score able test advised by basic research in psychology to give the most complete coverage of personality possible in a brief time. The 16 PF questionnaires was developed by Cattell, Eber and Talsuka (1970) and published by Institution for Personality and Ability Testing (TPAT). This test was designed for use with individuals aged sixteen and above. This test measures 16 personality factors. It consists of 187 items. This test requires 45-60 minutes for administration. In Indian conditions S.D. Kapoor (1982) had adopted the test.

2.3 Procedure: First of all BMI of the subjects was calculated and noted down. The whole sample was divided into three groups on the basis of BMI. 28 participants fell in overweight group, 120 participants in an obese group, and 52 participants in over obese group. 16 PF was given to each of the participant one by one. Scoring was done according to the rules given in manual. Raw scores and sten scores were calculated. Sten scores were converted into the second order factors and these were treated as final scores. Finally, four second ordered standard (Sten) scores were obtained: (i) introverted vs. extroverted, (ii) Low anxiety Vs. High anxiety, (iii) tender minded emotionally Vs. Tough poise, and (iv) Subduedness Vs. Independence.

TABLE-1: Calculation Of BMI

Variables	BMI	Introverted/ Extroverted	Low Anxiety/ High Anxiety	Tender Minded Emotionality/ Tough Poise	Subduedness/ Independence	Systolic B.P
Introverted/ Extroverted	-.05	-				
Low anxiety /high anxiety	-.25**	.19**	-			
Tender minded emotionality / tough poise	.10	.30**	-.28**	-		

Subduedness/independence	-.02	.43**	-.06	.07	-	
Systolic B.P	.23**	-.18**	-.19**	.13*	-.06	
Dystolic B.P	.15*	-.20**	-.22**	.07	-.05	.41**

* Correlation is significant at .05 level

**Correlation is significant at .01 level

3. RESULT AND DISCUSSION

To fulfill the main objective of the study Pearson product moment correlation method was employed between BMI and second order factors of personality i.e. Extroversion, Anxiety, Tough poise and Independence and between blood pressure i.e. systolic and diastolic. It was found that there were significant correlation between BMI, personality and blood pressure at .01 level of significance and .05 level of significance showing in table no. 1. BMI is correlated with low/high anxiety and systolic blood pressure at .01 level of significance. Extroverted/introverted personality score was positively and significantly correlated with other personality variables but also negatively significant with blood pressure at .01 level of significance. Low /high anxiety subjects were negatively and significantly correlated with emotionality and blood pressure at .01 level of significance. Tender/tough poise personality subjects were significantly correlated with systolic blood pressure at .05 level of significance. Subduedness/independent personality subjects score were not found to be correlated with any variables of the study at any level of significance. Systolic blood pressure scores were found significant at .01 level of significance with diastolic blood pressure. Jaifor, Chaturvedi and Pepps 2006 documented that weight gained in adulthood is itself a risk factor of the development of hypertension. It was also found that there were significant groups on anxiety at .05 level of significance. Hillman, Dam and Huang (2010) support the present, they found that trait anxiety and depressive symptoms were positively associated with BMI and percentage body fat Petry, Pietrzak and Wagner (2008) reported that BMI was significantly associated with most mood, anxiety and personality disorder Zhao, Ford Dhingra etc at (2009) found that women who were either overweight obese were significantly more likely than women with abnormal BMI to have depression and anxiety.

Mebrahtu and Usman, etal (2006) reported that BMI did not have a significant effect on BP in lean people (BMI<19) and in those with high BMI, but positively correlated to SBP in those with normal BMI. BMI and age appear to play a synergistic role increasing a strong association with BP. Dua and Bhker, etal(2014) found that there was a significant positive correlation between BMI, fat percentage and blood pressure both SBP as well as DBP. Odds ratio showed that overweight/obese subjects were more likely to have hypertension than those with normal BMI.

In the end, it is concluded that somatic constitution (bodyweight) does or does not imply psychological and physiological ill effects.

4. REFERENCES

- [1] AHA (American Heart Association) (2000). *Heart and Stroke Facts: 1996 Statistical Supplement*, Dallas, TX: Author.
- [2] Beck, C. K., Rawlins, R. P., & Williams, S. R. (1984). *Mental health-psychiatric nursing: A holistic life-cycle approach*. St. Louis: Mosby.
- [3] Bray,G.A.(1984). The role of weight control in health promotion and diseases prevention. In J.D.Matarazzo, S.M.Weiss,J.A.Hero, N.I.Miller and S.M.Weiss(Eds.), *Behavioural health :A Handbook of Health Enhancement and Disease Prevention*, New York; Wiley.
- [4] Calle,E.E.,Thun,M.J.,Petrelli,J.M.etal(1999).The new England Journal of Medicine,341,1097-105.
- [5] Cattell, R.B., Eber, H. and Wand Tatsuoka (1970). *The Handbook for the Sixteen Personality Factor Questionnaire (16PF)*. Champaign, Illinois: Institute for Personality and Ability Testing.
- [6] Calle,E.E.,Thun,M.J.,Petrelli,J.M.etal(1999).The new England Journal of Medicine,341,1097-105.
- [7] Center for Disease Control and Prevention. (2008). Obesity and overweight: Introduction. Retrieved from <http://www.cdc.gov/NCCDPHP/dnpa/obesity/>
- [8] Davis, C., Levitan, R. D., Carter, J., Kaplan, A. S., Reid, C., Curtis, C., Patte, K., & Kennedy, J.L. (2008). Personality and eating behaviors: A case-control study of binge eating disorder. *International Journal of Eating Disorders*, 41, 243-250.
- [9] Dua,S.,Bhuker,M.,Sharma,P.,Dhall,M AND Kapoor,S.(2014). Body mass index related to blood pressure among adults. *North American Journal of Medical Sciences*, 6(2):89:95.
- [10] Flegal, K. M., Graubard, B. I., Williamson, D. F., & Gail, M. H. (2005). Excess deaths associated with underweight, overweight, and obesity. *Journal of the American Medical Association*, 293(15), 1861-1867.
- [11] Ford, E.S. (1999). Body mass index and colon cancer in a national sample of adults US men and women. *American Journal of Epidemiology*, 150,190-398.
- [12] Hillman, J.B.Dorn,L.D.,Bin Huang(2010). Association of anxiety and depressive symptoms and adiposity among adolescent females,using dual energy X-ray absorptiometry. *Clinical Pediatrics*. 49(7):671-7.
- [13] Irvine M.J,Garner ,D.M, Olmsted,M.P and Logan,A.G.(1989). Personality differences between hypertensive and normotensive individuals: Influence of knowledge of hypertension status. *Psychosomatic Medicine*. 51(15):537-49.
- [14] Jeffery,R.W.(1991). Weight Management and hypertension. *Annals of Behavioral medicine*, 13,18-22.
- [15] Jeffery, R.W.(1992). Obesity a risk factor of cardiovascular disease? *Annals of Behavioral medicine*, 14,109-112.
- [16] Kapoor, S.D. (1982). *Manual for the 16PF*. Delhi : Psycho Center
- [17] Khan,H.S.and Williamson,D.F(1994).International Journal of obesity and related metabolic disorders,18,686-91.
- [18] Kakizaki,M.,Kuriyama.,S,Sato,Y.,Shimazu,T.,Matsuda Ohmori,K.,Nakaya,N.,Fukudo,A,Fukudo,S.,Tsuji,I.(2008).Personality and body mass index : across-sectional analysis from the Miyagi Cohort Study. *Journal of Psychosomatic Research*, 64(1):71-80.
- [19] Kaplan,R.M.,Sallis,J.F.and Patterson,T.L.(1930): *Health and Human behavior*, New York: McGraw Hill.
- [20] Kohlar,T.,Speier,U,Richter,R.(1994). The correlation between blood pressure value and personality score in the FPI-R in a non-clinical sample. *Psychotherapie,Psychosomatic,medizinische Psychologie*.44(3-4):84-8.
- [21] Larse,J.K.,Geehen,R.,Maas,C,deWit,P.,Van Anlluerpen,T.,Brand,N
- [22] Van Ramshorst,B.(2004).Personality as a predictor of weight loss maintainance after surgery for morbid obesity. *Obesity research*, 12(11), 1828-34
- [23] Lee,I.M., Hsieh,C. And Paffenbarger, R.S.(1995). Exercise intensity and longevity in men: The Harvard Alumni Health Study. *Journal of the American Medical Association*, 273, 1179-1184.
- [24] Levinthal, 1990. *Introduction of Physiological Psychology*.(3rd eds.), New Jersey: Prentice Hall.

- [25] Mufunda,J.Mebratu,G.,Usman,A.Nyarango,P.Kosia,A.Ghebrate,Y.,Oqbamariam,A.,Masjuan,M.,Gebremichael,A.(2006).The prevalence of hypertension and its relationship with obesity: results from a national blood pressure survey in Erilrea. *Journal of human hypertension* 20(1):59-65.
- [26] Must,A.,Spadano,J.Coakley,E.H.,Field,A.E.Colditz,G.andDietz,W.H.(1999). The disease burden associated with over-weight and obesity. *Journal of the American Medical Association*, 282, 1523-1529.
- [27] Neovis, M., Sundstron, J., & Rasmussen, F. (2009). Combined effects of overweight and smoking in late adolescence on subsequent mortality: nationwide cohort study. *British VALENTI, OMIZO, MEHL-MADRONA 60 Medical Journal*, 338:b496.
- [28] Olshansky, S. J., Passaro, D. J., Hershow, R. C., Layden, J., Carnes, B. A., Brody, J., Hayflick, L., Butler, R. N., Allison, D. B., & Ludwig, D. S. (2005). A potential decline in life expectancy in the United States in the 21st century. *New England Journal of Medicine*, 352(11), 1138-1145.
- [29] Pronk,N.P.Tand,A.W. and Connar,P.(1999) Obesity,Fitness, Willingness to communicate and health care casts. *Medical Science Sports Exercise*, 31, 1535-43.
- [30] Provencher,V.,Begin,C,GagnonGirouard,M.P.,Tremblay,A,Boivin,S.,Lemieux,S.(2008) Personality traits in overweight and obese women: associations with BMI and eating behaviors, *Eating Behavior*,9(3):294-302.
- [31] Ryden, A., Sullivan, M., Torgerson, J. S., Karlsson, J., Lindroos, A. K., & Taft, C. (2003). Severe obesity and personality: a comparative controlled study of personality traits. *International Journal of Obesity*, 27, 1534-1540.
- [32] Ryden, A., Sullivan, M., Torgerson, J. S., Karlsson, J., Lindroos, A-K., & Taft, C. (2004). A comparative study of personality in severe obesity: A 2 year follow-up after intervention. *International Journal of Obesity*, 28, 1485-1493.
- [33] Sheldon,W.,Stevens,S.and Tucker,W.(1941). *The variety of human physique: an introduction to constitutional psychology*, New York:Harper and Brothers.
- [34] Sullivan, S., Cloninger, C. R., Przybeck, T. R., & Klein, S. (2007). Personality characteristics in obesity and relationship with successful weight loss. *International Journal of Obesity*, 31, 669-674.
- [35] Valenti,M.P.,Omizo,M.M.and Mehl-Madroma,L.(2011).Personality and obese body mass index, *The New School Psychology Bulletin*,Vol. 9(1).
- [36] Wall-Manning H.J.,k night R.G,Spears G.F and Jaulin, J .M(1986). The relationship between blod pressure and personality in a large unselected adult sample. *Journal of Psychosomatic Research*, 30(3):361-368.
- [37] World Health Organization. (2011). Obesity and overweight. Retrievedfrom<http://www.who.int/dietphysicalactivity/publications/facts/obesity/en>
- [38] Zhao,G,Ford, E.S.,Dhingra,S.,Lic,Strine T.W.Mokdad,A.H.(2009)-Depression and anxiety among US adults: *International Journal of Obesity*.33(2):257-66.

A Review Of Secure Friend Recommendation Scheme For Online Social Networks

Paper ID	IJIFR/V3/ E9/ 045	Page No.	3412-3416	Subject Area	Computer Engineering
KeyWords	Online Social Networks, 1-Hope, Multi Hope Chain, Privacy, Friend Recommendation				

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Abstract

Online social networks (OSNs) attract million people to use every time, it greatly increase users' social friend circle by using friend recommendation scheme. OSN users' old social relationship can be established as 1-hop trust relationship but now it can be characterized as multi-hop trust chain while friend recommendation scheme runs. As in our daily life we make friends through our matched attributes, social circle can also be established by users attribute what they share. i.e. classmate, cousins, siblings, profession etc. When OSN user's friend circle is expended it may require the privacy against the friend to friend recommendation because sometime users don't want to share their identity and information to the public. In this paper, OSN users privacy is preserved by a trust-based friend recommendation scheme, in this scheme users apply their attributes and find matched friends, and they can also establish social relationships with the people who are not their friend via a multi-hop trust scheme i.e. friend of friend.

1. INTRODUCTION

Online social networks (OSNs) provide a new way of communicating with other people and make new friends. As we usually do in our real life [1]. Users who like social relationship always want to increase their friend circles to improve various social demands, e.g., leisure, education, and business. On that type cases, OSN users may request their close friends to give valuable feedback and provide useful recommendation, and then through this recommendation users can easily establish a new connection with other people who are friend of users close friend. i.e. friend of friend. As some work indicated under [2], [3], the social friend circle on the OSNs is an irregular context-aware trusted friendship between two user, through which we think that establishing a multi-hop trust chain between two strangers is possible by assuming previous 1-hop trust of old friends on the OSNs. However, the recommendation scheme affect some extremely important privacy severance in the internet, so that OSN users' privacy pertain about their social friendship and own identities, also the recommended information when the information is exchanged, these information should be properly addressed. Otherwise, attacker or invalid user may easily perform cybercrime and physical attacks, e.g. identity attack, if the attacker have some basic information about the user then he can easily attack using this information, [3] ,[4], inferring attack on societal relationships [5], and own profile leakage [6].

We took an example that Alice request to find a cardiologist to professional OSNs, such as PatientLikeMe, one for helpful suggestions and exploratory diagnose. On the other hand, directly ask for the recommendations to the people who are not friends yet or to a non-close friend. This may not only bring out Alice's identity, but also uncover her health situation and medical information. More worse existing recommendation phases [6], [7] applying own profile to recommend non-close friend will discover OSN users' social relationships to the strangers or public, which close up the patients to use it, and the possibility to the establishment of the multi-hop trust chain is fall down if any user on that multi hop chain give a negative feedback. On the other way, recent approaches may not accomplish the fine-grained and context-aware feedback automatically, because of the fact that OSN users have to find out the recommended friends on their own opinion to the recommendation query.

As in the example, Alice would request to her friend who work in a hospital, but not a teacher [1]. To solve the above problems, we assume the possible concept of using OSN users' social and professional attributes to launch the multi-hop trust chain depend on context-aware 1-hop trust relationship, where shared social attributes are very much useful to form a trusted relationship. In this paper, friend recommendation scheme with preserved privacy for OSNs is designed by using users' social dimensions and their previous trust relationships to form a new multi-hop trust chain between strangers.

2. BRIEF REVIEW OF LITERATURE

- ▶▶ Earlier privacy issues may arrive with some existing works [4], [8] shows the possible security severances on the OSNs, on which they consider adversary attack to OSN users' attributes, their own identities and their social relationships. Fong et al. [11] produce formalize and generalize access model with the privacy preservation mechanism for Facebook. Carminati. et al. also introduced an access control scheme which is useful for information sharing in web-based networks in [12], it may also considers the type of relationship, trust metric, and policy design degree of separation. There is a leading difference between the scheme of Carminati and the basic work in [12] and the work in our paper is that for access control decentralized architecture was used by them, which may find possible security breaches, like constructing identity, attributes and trust information.
- ▶▶ On this queue on research, Squicciarini et al. in [11], use game theory for content sharing to model the privacy management, which has the same concept as our idea to provide privacy for social account and attributes [10]. In specific manner, their work in [12] for users profile information, automatic access policy generation is provided. Mislove et al. in [13] discourse about the possible illation on user account based on existing relationships, which is also could be a very powerful attack on recognizing a real identities based on user attributes.
- ▶▶ Mislove et al in [2] introduced the large-scale measurement study of multiple online social networks and analysis of that structure. And canvas the data which they gathered from different popular online social networks. Then move slowly the publicly accessible user links on these sites, obtain a big portion of each social network's graph. Their set of data may contain over 11.3 million users and 328 million links. That was there their first study. Properties of online social networks i.e. power-law, small-world, and scale free were confirmed by their results. They observe that the in degree nodes have to match with the out degree. So that they discourse about the structural features to the design of social network based systems.
- ▶▶ B. Zhou and J. Pei in [3] proposed a scheme for adversary and neighbourhood attacks. As now a day more and more people want to connect with their friends and friend of friend [1] via social networks. As Social Users share their data publically on social site, privacy and security preservation is very important issue [10]. There is a possibility of having attacks on individual's profile. This attack may be very much possible from the known user or close friend. If one may have a local knowledge about other user he or she can easily become an adversary and may attack the privacy of social user. Most of the previous studies on privacy preservation can work with relational data only, and cannot deal to social network data. [3] Proposed the scheme for preserving privacy in social network data. They recognize essential type of privacy attacks i.e. neighbourhood attacks. If some knowledge about the neighbours of a target user and the relationship between the neighbours is available

to the adversary, social network re-identified the victim even if the conventional anonymization techniques preserved the identity of victim.

- ▶▶ L. Backstrom proposed a scheme for finding a friend in improved geographical and spatial social network [5]. As geography and social relationship are improving interlace, the people with whom we interact daily may almost always live around us. As today's people spend their maximum time to maintain their online relationship based on data related to geographical and social relationship [4], [8].becoming arriving precise, allowing us to design dependable models to show their interaction. Important deduction in the design of the services which are location-based, intrusion detection security and social media supporting local group of people.
- ▶▶ User-supplied address data and associations network is used between members of the Facebook social network [11] P.W.L. fong, directly detect and measure the relationship between geography and friendship. By using these measurements, Lars, introduce a new algorithm through which the location of social network user from a thin set of located users with performance that transcend IP-based geolocation is predicted. This algorithm is very useful and possible to scale, and could be run on hundreds of millions of users network.
- ▶▶ Privacy and security may be an opportunity and also a challenge[9]. C. Zhang, J. Sun Different Online social networks or social networking sites such as Facebook, Myspace, and Twitter have great experienced improvement in current years. These OSNs provides attractive way of online social interactions and relations, but also grows the issues for privacy and security breaches. [10] proposed issues related to the designing of security and privacy preservation of OSNs and OSN users. They found that there were a constitutional design conflicts between this scheme and the existing designing aim of OSNs i.e. usability and sociability. They shows the unique security and privacy design issues that is raised by the basic functionalities of online social networks.
- ▶▶ Online social network allow the connection between peoples [1]. Linke Guo, through this social connection they can communicate with each other. The main purpose of online social networks is to create a social relationship via shared social attributes [1],[2]. Social attributes e.g. year of passing, area of interest, classmate, colleges etc. OSN's main motive is to create secure relationship between people which can also be able to preserve privacy [9]. For joining the OSN user may have to create their unique profile [10]. With their name, location, area of interest, hobbies etc. these information must be considered as social attributes which is very much useful for recommendation process [1],[2]. Friend recommendation process is proposed by Chi Zhang [1], in which attributes based recommendation process is done.
- ▶▶ Friendship can be established through 1-hop trust policy which is not as much secure as multi hop trust chain, under which trusted chain of multi-level friendship is maintained. Trusted authority is capable of giving a recommendation to users friend,

as in the example [1], Alise need to communicate with an cardiologist, and request her friend, her friend recommend her a person who works in hospital but not a teacher, this process simply done through the shared social attributes.[2]

3. CONCLUSION

This paper is written to discuss about the online social network and trust based privacy preserving friend recommendation. Friend recommendation is done using the shared social attributes of user such as year of passing, colleges, profession etc. while user request for some special attribute to his or her friend. He may recommend a friendship with the valuable people based on attributes. Using this scheme two non-close friends or stranger can easily establish a relationship using 1-hop or multi hop trust chain. Trust level is maintained without affecting the individual user identity.

4. REFERENCES

- [1] Chi Zhang, Linke Guo, Yuguang Fang, "A Trust-Based Privacy-Preserving Friend Recommendation Scheme for Online Social Networks", IEEE Trans, dependable and secure computing, vol. 12, no. 4, July/August 2015
- [2] A. Mislove, M. Marcon, K. P. Gummadi, P. Druschel, and B. Bhattacharjee, "Measurement and analysis of online social networks," in Proc. 7th ACM SIGCOMM Conf. Internet Meas., 2007, pp. 29–42.
- [3] B. Zhou and J. Pei, "Preserving privacy in social networks against neighborhood attacks," in Proc. IEEE 24th Int. Conf. Data Eng., 2008, pp. 506–515.
- [4] L. Backstrom, E. Sun, and C. Marlow, "Find me if you can: Improving geographical prediction with social and spatial proximity," in Proc. 19th Int. Conf. World Wide Web, 2010, pp. 61–70.
- [5] R. Dey, C. Tang, K. Ross, and N. Saxena, "Estimating age privacy leakage in online social networks," in Proc. IEEE Conf. Comput. Commun., 2012, pp. 2836–2840.
- [6] M. von Arb, M. Bader, M. Kuhn, and R. Wattenhofer, "Veneta: Serverless friend-of-friend detection in mobile social networking," in Proc. IEEE Int. Conf. Wireless Mobile Comput. Netw. Commun., Oct. 2008, pp. 184–189.
- [7] R. Dhekane and B. Vibber, "Talash: Friend finding in federated social networks," in Proc. Linked Data Web, 2011, pp. 1–8.
- [8] C. Dwyer, S. R. Hiltz, and K. Passerini, "Trust and privacy concern within social networking sites: A comparison of facebook and myspace," in Proc. 13th Amer. Conf. Inf. Syst., 2007, p. 339.
- [9] C. Zhang, J. Sun, X. Zhu, and Y. Fang, "Privacy and security for online social networks: Challenges and opportunities," IEEE Netw., vol. 24, no. 4, pp. 13–18, Jul./Aug. 2010.
- [10] P. W. L. Fong, M. Anwar, and Z. Zhao, "A privacy preservation model for facebook-style social network systems," in Proc. 14th Eur. Conf. Res. Comput. Security, 2009, pp. 303–320.
- [11] A. C. Squicciarini, M. Shehab, and F. Paci, "Collective privacy management in social networks," in Proc. 18th Int. Conf. World Wide Web, 2009, pp. 521–530.
- [12] B. Carminati, E. Ferrari, and A. Perego, "Enforcing access control in web-based social networks," ACM Trans. Inf. Syst. Security, vol. 13, no. 1, pp. 6:1–6:38, Nov. 2009.
- [13] A. Mislove, B. Viswanath, K. P. Gummadi, and P. Druschel, "You are who you know: Inferring user profiles in online social networks," in Proc. 3rd ACM Int. Conf. Web Search Data Mining, 2010, pp. 251–260.

Drowsiness Detection While Driving Using OpenCV

Paper ID	IJIFR/V3/ E9/ 048	Page No.	3417-3422	Subject Area	Computer Engineering
KeyWords	Computer Vision, Drowsiness Detection, OpenCV, Raspberry Pi Module				

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Abstract

Driver's inattention while driving is one of the main causes of road accidents. There are plethoras of reasons for driver's inattention such as drowsiness, distraction caused by mobile phones, chatting with fellow members in the vehicle, infotainment in the vehicle etc. Monitoring a driver to detect drowsiness is a most challenging as well as daunting task as it involves the in depth analysis of physiological and behavioral elements of the driver. Numerous approaches have been made to track the drowsiness of the driver behind the wheel and embracing Computer vision techniques is one among them .In this thesis we have developed an efficient drowsiness detection system using Computer vision approach which involves detecting face of the driver, extraction of area of interest such as eye region, decision making based on the amount of time for which eye remained closed. The proposed system is promising in providing an efficient performance on low quality webcam and without the use of infrared light which is precarious for the human eye and also try to decimate the fatalities caused by motor vehicle accidents due to fatigued drivers.

1. INTRODUCTION

Driving is a complex task where the driver is responsible of watching the road, taking the correct decisions on time and finally responding to other driver's actions and different road conditions. Vigilance is the state of wakefulness and ability to effectively respond to external stimuli. It is crucial for safe driving. Among all fatigue related accidents, crashes caused by fell-asleep-drivers are common and serious in terms of injury severity. Majority of the road accidents are mainly due to the driver's fatigue. Driving for a long period of time causes excessive fatigue and tiredness which in turn makes the driver sleepy or loose awareness. The study states that the cause of an accident falls into one of the following main categories: (1) human, (2) vehicular, and (3) environment. The three main categories (human, vehicular, and environmental) are related among each other, and human error can be caused by improper vehicle or highway design characteristics. The recognized three major types of errors within the human error category: (1) recognition, (2) decision, and (3) performance. Decision errors refer to those that occur as a result of a driver's improper course of action or failure to take action. A recognition error may occur if the driver does not properly perceive or comprehend a situation. To perform all these activities in time and accurately its necessary that driver must be vigilant.

2. LITERATURE SURVEY

Many researchers have worked in recent years on systems for driver inattention detection, focused mainly on drowsiness, with a broad range of techniques. Sleep has a long history of research in the fields of psychology and medicine, where accurate measurements and indicators have been developed. Electroencephalograms (EEG) represent the electrical changes in the brain, measured with a series of electrodes placed in the scalp. The electrodes detect small voltages produced in the brain cortex. These potentials form waves at several frequencies, known as delta, theta, alpha, beta and gamma waves, which are linked to different cognitive and motor processes, including drowsiness and the different sleep stages. Brain studies couple EEG with electrooculography (EOG), which detects eye movements, and electromyogram (EMG) that monitors muscular tone. These measurements provide the best data for detection of drowsiness, and as such have been used by several drowsiness detection systems, usually in conjunction with heart rate and breathing rate. The problem of this technique is that they are intrusive to the subject. They require electrodes and other sensors to be placed on the head, face and chest, which may annoy the driver. They also need to be carefully placed: installing the electrodes to obtain an EEG requires external help and takes a few minutes, and medical equipment is always expensive. Recent research has introduced some contact-less readings, but no remarkable results have been achieved so far. Nonetheless, physiological measures such as EEG have been used in some projects, and are frequently used as the ground truth for testing other, less invasive methods.

A driver's state of attention can also be characterized using indirect measurements and contact-less sensors. Lateral position of the vehicle inside the lane, steering wheel movements and time-to-line crossing are commonly used, and some commercial systems

have been developed. These systems do not monitor the driver's condition, but its driving. Volvo Cars introduced its Driver Alert Control system [1], which is available on its high-end models. This system uses a camera, a number of sensors and a central unit to monitor the movements of the car within the road lane, to assess whether the driver is drowsy or not. Mercedes-Benz has introduced a similar system in its newest E-Class vehicles. However, they face several limitations such as geometric characteristics and state of the road, and driver experience. They also require a training period for each person, during which the driving style of the user is learned and modeled.

3. PROPOSED SYSTEM

The aim of this project is to develop a computer vision method able to detect and track the face of a driver in a robust fashion, also determine the status of the eyes, and with the highest precision possible. It is to serve as the bases of an automatic driver fatigue monitoring system and alarm the driver to wake up and take the rest. India is a developing country and people in this country most of them are middle class who cannot afford costly drowsiness system into their vehicle. In this project our main aim is to develop a drowsiness detection system which will be suitable for standard of India so that common people can afford this at a low cost.

4. SYSTEM DESCRIPTION

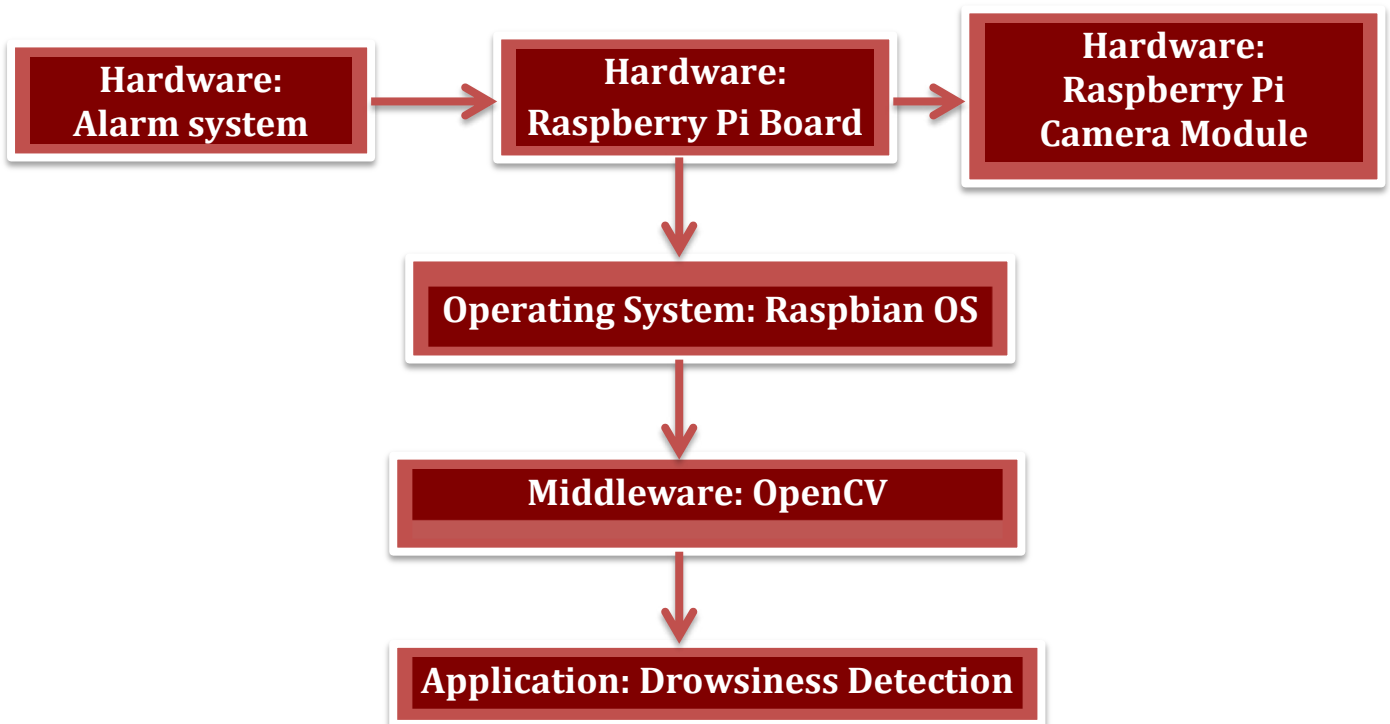


Figure 1: Design of System Hardware

The proposed system consists of Raspberry Pi Board, Raspberry Pi Camera Module and Buzzer as alarm system. Raspberry Pi Camera Module and Buzzer is connected to Raspberry Pi Board. Operating system and required dependencies are installed and configured. The dependencies includes OpenCV framework, as we are working with OpenCV we need to install and configure them also. We need to load the Drowsy Driver Detection program to Raspberry Pi Board. Once the program is installed the proposed system takes input from camera. And it detects the face and eyes and subsequently tracks the eyes and performs calculations to determine if the driver is drowsy. The warning system issues an alarm to the driver if the above condition is true.

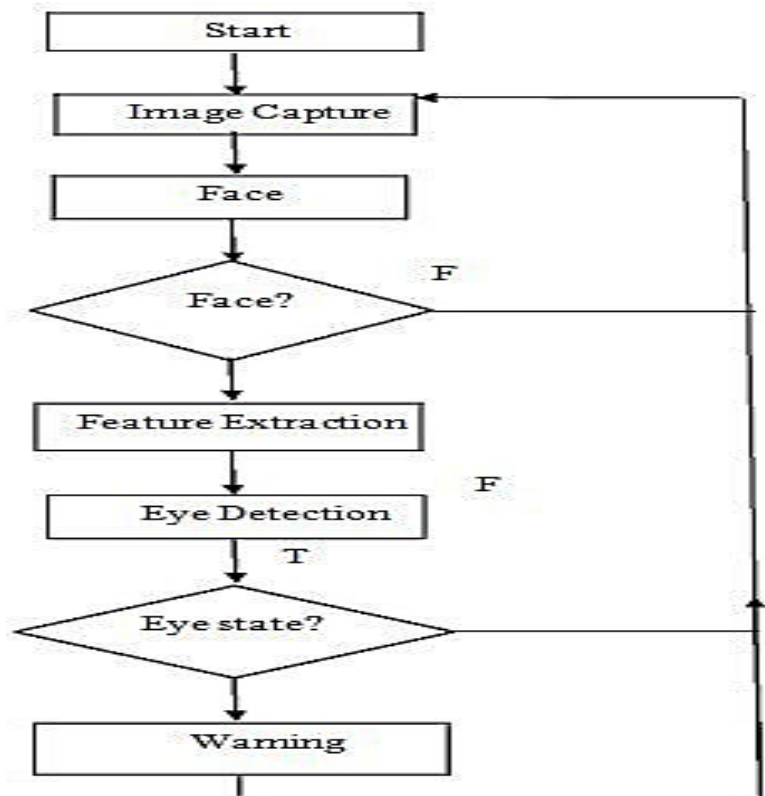
4.1 Hardware Requirements

- Raspberry Pi Board.
- Buzzer System.
- No Infrared Raspberry Pi Camera Module.
- 5V power supply.

4.2 Software Requirements

- Compiler Used: gcc.
- Operating System: Raspbian Wheezy OS.
- Language Used: C++.
- Tool Used: OpenCV Framework

4.3 Working Flowchart



The flowchart for the major functionalities of the Drowsy Driver Detection System is shown in fig.2. The major stages of algorithm are

- I. **Image Capture:** The image is captured from the video, where image is a numeric representation (normally binary) of a two dimensional image. The video is acquired by using a low cost web camera embedded with raspberry pi board.
- II. **Face Detection:** In every given frame the face is detected using a specified algorithm. Face detection is a computer technology that determines the locations and sizes of human faces in arbitrary (digital) images. It detects facial features and ignores anything else, such as buildings, trees and bodies. Face detection can be regarded as a specific case of object-class detection. The algorithms take into account variations in the image or video by factors such as face appearance, lighting, and pose. If the result of face detection comes positive then the algorithm proceeds to the next, otherwise the flow of algorithm goes back to the image capture stage.
- III. **Facial Feature Detection:** Facial Feature Detection is to find the exact location of facial features, such as mouth and eyes corners, lip contour, jaw contour, and the shape of the entire face. Face can have in a scene caused by factors such as intra-subject variations in pose, scale, expression, colour, illumination, background clutter, presence of accessories, occlusions, hair, hats, eyeglasses, beard etc. The feature detection is used to determine the region of eyes so that their status can be determined easily and quickly. It is performed by segmenting the face that has been detected.
- IV. **Eye Detection:** Eye detection is the essence of eye tracking and iris recognition. In this stage the eyes are detected in the specified region by the feature detection. In the beginning it looks for the Eigen eye. This process is time taking and it is done just once. After the detection of Eigen eye it is just matched in the other frames for the same candidate.
- V. **Eyes State:** In this stage, it is determined that whether the eyes are closed or open. The detection of eyes status is very important. It is done by an algorithm which will be explained in the later chapters. If the eyes are detected to be closed then the warning is sounded. If the eyes are open then the algorithm goes to the first step of the image capture. The same pattern repeats to check the status of the eyes.
- VI. **Alarm system:** After detecting the status of the eye's check whether its closed or open. If the eyes are closed then the alarm system must start working. It should be ended only after driver eyes are correctly opened.

5. CONCLUSION

The system is developed to detect drowsiness based on eye related parameters. The camera used to capture the feed is also designed specially to cater to the dim or no light conditions around the driver. The economics involved in building a real time product will also be reasonable. Our project can be used to detect drowsiness and thus help reducing the number of road accidents drastically.

REFERENCES

- [1] V. V. Dixit, A. V. Deshpande, D. Ganage, *Face Detection for Drivers' Drowsiness Using Computer Vision*, 5th Kuala Lumpur International Conference on Biomedical Engineering, IFMBE Proceedings Volume 35, pp 308-311 (2011).
- [2] Paul Viola, Michael J. Jones, *Robust RealTime Face Detection*, *International Journal of Computer Vision* 57(2), 137-154 (2004)
- [3] K. S. Chidanand Kumar, Brojeshwar Bhowmick, *An Application for Driver Drowsiness Identification based on Pupil Detection using IR Camera*, *Intelligent Human Computer Interaction*, pp 73-82 (2009).
- [4] Y. Matsumoto and A. Zelinsky, "An algorithm for real-time stereo vision implementation of head pose and gaze direction measurements," In *Procs. IEEE 4th Int. Conf. Face and Gesture Recognition*, pp.499-505, Mar 2000.

Energy Saving Home Automation System

Paper ID	IJIFR/V3/ E9/ 051	Page No.	3423-3427	Subject Area	Computer Engineering
Key Words	Water Pump Controlling, Energy Saving, Web Analysis, Real Time Data, Arduino, Raspberry Pi, Ultrasonic Sensor				

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Abstract

With the increase in consumption of energy and population, there is a grave need to conserve energy in every way possible. So to overcome the situation the latest technology coming up is the home automation technology. Home automation is gaining popularity nowadays. A smart home automation system is based on ensuring user life easier. It contains a large number of sensors which can control or monitor objects distributed in three-dimensional space. The sensors can be specialized in measuring temperature, humidity, pressure, light, noise, dust air, and so on. In our project we focus on bringing the basic need is such as controlling water wastage in tank when it is full and check if there is any gas leakage.

1. INTRODUCTION

Home automation is all about use and control of home appliances remotely or automatically. Early home automation began with labour-saving machines like washing machines, some home automation appliances are stand alone and do not communicate, such as a programmable light switch, while others are part of the internet of things and are networked for remote control and data transfer. Hardware devices can include sensors, controllers, actuators (to do things), and communication systems. Remote control can range from a simple remote control to a smart phone with Bluetooth, to a computer on the other side of the world connected by internet. Home automation systems are available

which consist of a suite of products designed to work together. There are a wide variety of technology platforms, or protocols, on which a smart home can be built. Each one is, essentially, its own language. Each language speaks to the various connected devices and instructs them to perform a function. The automation protocol transport has involved direct wire connectivity, powerline (PLC), powerline (PLC) and wireless hybrid and wireless. The increase of Wi-Fi's role in home computerization has primarily come about due to the networked nature of deployed electronics where electronic devices becoming part of the IoT (Internet of Things) applications using sensors to gather information about operating environment combined with cloud hosted analytics software's.

2. LITERATURE SURVEY

The definition of a Smart Home is uniform amongst the literature as an intelligent building with integrated devices that control features of the house. Home automation is the use and control of home appliances remotely or automatically. Early home automation began with labour-saving machines. Some home automation appliances are stand alone and do not communicate, such as a programmable light switch, while others are part of the internet of things and are networked for remote control and data transfer. Algorithms for Smart Spaces, by Cook and Youngblood (2008) stated that Smart Homes be "able to acquire and apply knowledge about its inhabitants and their surroundings in order to adapt to the inhabitants and meet the goals of comfort and efficiency". Initially, Smart Homes were houses with the sole ability to monitor and adjust environmental systems like heating and lighting, but Ricquebourg et al. (2006) asserted that since technologies have developed further, "any electrical component within the house can be included in the system". This general paper aims at presenting the Smart home concept. The details of this paper are a) The smart home concept b) The various network infrastructures specific to the habitat c) concepts to model the habitat and to provide the most adapted services to the inhabitants.

3. PROPOSED SYSTEM

The aim of this project is to develop an Energy saving home automation system. In this home automation we focus on controlling the water pump and checking the presence of leakage of gas, as it is the basic need in our country households. This is done by use of various sensors such as ultrasonic, gas sensors, temperature and humidity sensors. We give the web analysis of real time data in which the user can see whenever the water pump has turned on and off, and basic information such as temperature and humidity.

4. SYSTEM DESCRIPTION

The proposed system consists of Raspberry Pi Board, Arduino Board, Temperature Sensor, Ultrasonic Sensor, Motion Detection Sensor, and Gas sensor. Raspberry Pi acts as a Server. All Sensors are connected to the Arduino Board. Ultrasonic sensor is used to control the flow of water. The Ultrasonic Sensor is used to detect the presence of an object, or to measure the distance to the object. In this ultrasonic sensor is used to measure the distance between sensor and water in the tank. DHT11 is the temperature sensor, used

to measure the current temperature of the environment. LDR and PIR are the motion detection Sensor. It detects the any motion objects in its given surroundings. Gas Sensor is used to find any leakages of gas at home. Using Wi-Fi router or internet connections user can check the temperature, humidity, flow of water in the tank, gas leakages. All the data are stored in database so the user can check any time.

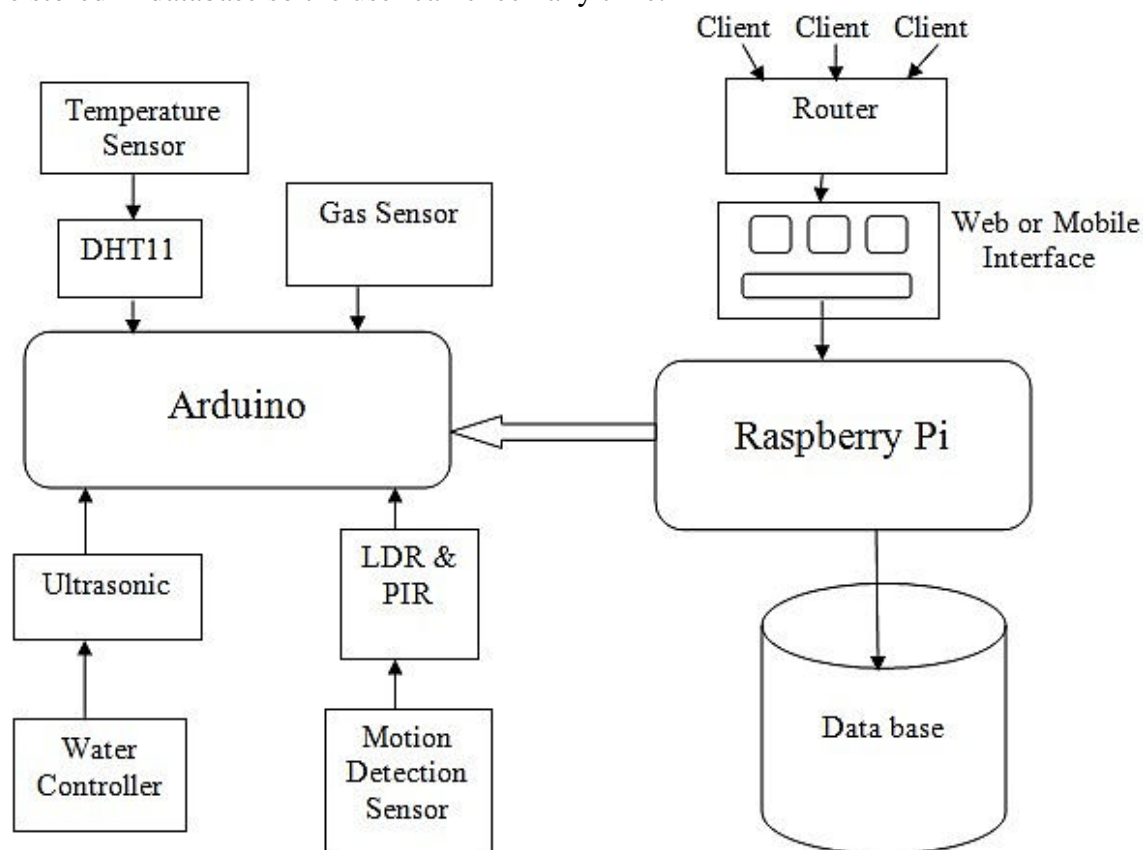


Figure 1: Design of the ESHATS System

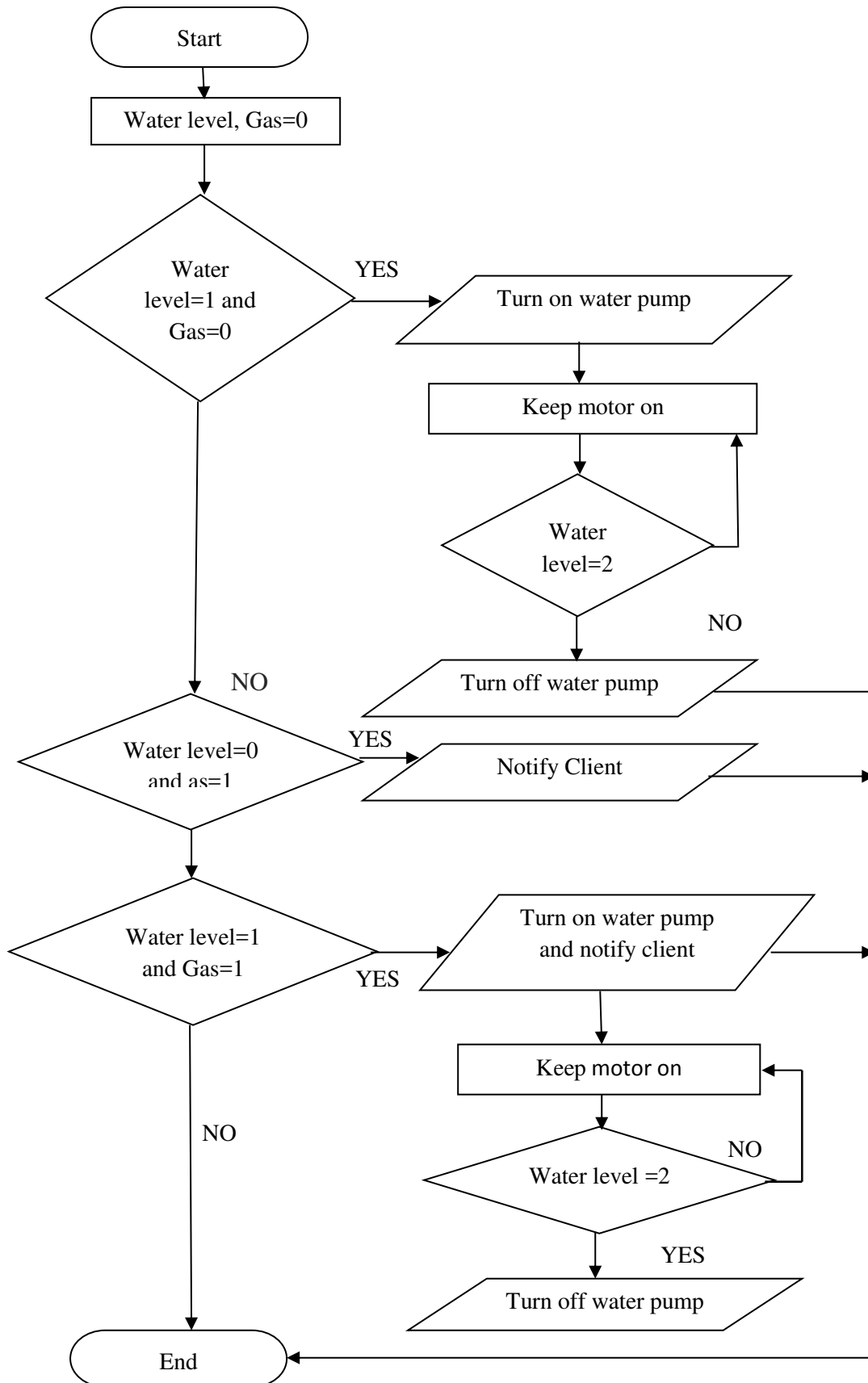
4.1 Hardware Requirements

- Raspberry Pi Board.
- Arduino Board.
- Temperature Sensor (DHT11).
- Gas Sensor.
- Motion Sensor (LDR and PIR).
- Ultrasonic Sensor.
- 5V power supply.

4.2 Software Requirements

- Compiler Used: node.js command prompt.
- Operating System: Raspbian OS.
- Language Used: node.js.
- Tool Used: React Developer, NodeMCU and Chrome analysis tool.

4.3 Working Flowchart



A flowchart of the major functions of the controlling water flow in tank. The major stages of algorithm are:

- i.) Initially, the max and min values of the tank are loaded into the sensor. So that when it when water goes beyond that value then sensor should perform the given particular task.
- ii.) Then, Ultrasonic sensor is placed top of the tank. Then the ultrasonic Sensor will measure the distance of water and itself.
- iii.) When System starts, the sensor measures the distance of water, if distance is minimum, it means the tank is full, then the given min value motor will off automatically.
- iv.) When the distance of water and sensor goes beyond the given max value. It means tank is empty, and then the motor will on automatically.
- v.) Similarly, the gas sensor will also perform its operation on the same time that the ultrasonic sensor works.
- vi.) The gas will be detected only beyond 750BTU. Because, the gas leakage will be dangerous only if it leaks beyond 750BTU.
- vii.) When the gas sensor detects the leakage it will inform to the user.

5. CONCLUSION

Energy Saving Home Automation System, providing the cheap and basic need of automation in a home is the main focus here. Through this automation the client gets the basic need in a household, which is the detection of water level in a tank and also turning the water pump motor on/off depending on the level of water in the tank and also sensing the presence of leakage of gas. Client can also access the web page which gives the details of home temperature/humidity, when the motor was on/off and giving graph based analysis of data. As said, the enhancement of automation is never ending since every appliances present can be automated.

6. REFERENCES

- [1] Silviu Folea ; Daniela Bordencea ; Casiana Hotea ; Honoriu Valean. "Smart home automation system using Wi-Fi low power devices".
- [2] Diane J. Cook, G. Michael Youngblood, and Gaurav Jain "Algorithms for smart spaces".
- [3] Deleawe et al. (2010), "importance of monitoring air quality indoors so as to mitigate health problems".
- [4] Ricquebourg et al. (2006), "any electrical component within the house can be included in the system".
- [5] Stefan Tilkov ; Steve Vinoski, "Using JavaScript to Build High-Performance Network Programs".

Social Security Among The Elderly Persons In Tripura: An Assessment

Paper ID

IJIFR/V3/ E9/ 052

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Abstract

Social security is an essential human right. It is a major factor of the elderly persons for a long time. It can be financial security, health security, societal as well as family status with support. Elderly are the senior citizens of the nation leading their lives in a transitional phase. The transition from middle to old age is a period of critical biological and social emotional fabric of the society and consequent changes in the living arrangements have created more problems for the elderly to adjust with the changing conditions in living. Elderly persons are socially insecure and due to this the distribution of all the things are unequal and they are discriminated. Social insecurity of the elderly persons can change their patterns of vulnerability, sources of protection, financial security, health security etc. Present paper mainly divided into four sections. First section deals with the introduction of social security elderly of the persons. Second section describes the social security of the elderly persons in Tripura. Third section identifies the factors which affect the social security of the elderly persons and comes out with policy direction and recommendation towards protecting social security for the elderly persons in Tripura.

1. INTRODUCTION

Social Security is both a concept as well as a system. It represents basically a system of protection of individuals who are in need of such protection by the State as an agent of the society (Report of the working group on Social security, 2001). Social security is a basic

human right. The object of social security is to provide livelihood to those who cannot earn their livelihood by work for chronic or temporary reasons. The older persons need social security as they cannot work and earn due to age. The social security needs of the elderly consist of food, clothing, shelter, health care and emotional support. It may be provided by social assistance or social insurance or a combination of both. The main risk when one reaches old age is poverty or income insecurity owing to the loss of on to earn income, whether partially or completely. This was the main justification for the first pension schemes, which emerged at first only in the highly developed countries but which have since spread across the whole world. (Coverage by social security pensions: Income security in old age, 2010-11). Elderly are the senior citizens of the nation leading their lives in a transitional phase. The transition from middle to old age is a period of critical biological and social emotional fabric of the society and consequent changes in the living arrangements have created more problems for the aged to adjust with the changing conditions in living. India is an agriculture-dominated economy where is dependent on agricultural and allied occupations. The aged (60+) represent about seven to eight percent of the population, most of them living below the poverty line. The aged in the unorganized sector like agriculture workers, casual workers and landless labourers are in economically family responsibilities and unharmonious relations are the major problems needs of the family and their personal requirements they have to work as long as they live. Moreover, the problems become more complicated when their children start neglecting them and elderly people face phycho-social problems coupled with economic and health problems. Population ageing is the most significant emerging demographic phenomenon in the world today. In 1950, the world population aged 60 years and above was 205 million (8.2 per cent of the population) which increased to 606 million (10 per cent of the population) in 2000. Asia has the largest number of world's elderly (53 %), followed by Europe (25 %). (Balamurugan & Ramathirtham, 2012). The need for social security may be chronic of the persons who are unemployed and who are unemployable because of their age or other disabilities. It may be temporary in the case of others. In the latter case the need for social security arises when a contingency arises such as sickness, accident, maternity loss of employment due to retrenchment or closure of a unit, old age or death of a breadwinner. These occurrences may be normal incidences of life or may be the result of natural or manmade disasters or catastrophes. The social security needs of the elderly consist of food, clothing, shelter, health security and above all psychological or emotional support. All these needs can be met to a large extent if the people have adequate income. Income security is therefore given preminent position in any system of social security for the elderly. This security may be provided in cash or in kind or both (Subramanya, 2005).

1.1. Social Security of Elderly Persons in Tripura

Social security is a major factor of the elderly persons for a long time. It can change the patterns of vulnerability and sources of protection. Social security can be financial security, health security, societal as well as family support. Old age pension is playing a major role as improving the status of social security of the elderly persons. In Tripura

Government implement several programme and schemes in different plan period for the elderly persons with the help of central government which can humanizing the financial security of the elderly persons and through these they can take care of their health condition and others also. Some of the financial programmes are mentioned below:

➤ **Indira Gandhi National Old Age Pension (IGNOAPS)**

This scheme has been introduced with a view to provide relief to the older persons whose age is 60 years and above and belong to BPL category. This scheme was started in the State of Tripura from the year 1995. The NOAP is a Central & State Sharing scheme. Central Share Rs. 200/-for 125692 Nos. beneficiaries whose age groups are 60 to 79 yrs.) & other 16363 Nos. beneficiaries age are 80 yrs and above they are getting 700/- per month as (State Share Rs. 200/- and Central Share Rs. 500/-)

➤ **Old Age Pension Scheme (State):**

The scheme was introduced to address the pending proposals under IGNOAPS for only BPL card holder. The rate of pension is Rs. 500/- (Rupees five hundred) only per month w.e.f. 01-09-2012 and the whole amount would be paid by the state Govt. only. The age of the applicants should be from 60 years & above older person & BPL Card Holder. Funded fully by the State Government @ Rs. 500/- per head per month.

2. REVIEW OF LITERATURE

- International Social Security Association (2007) discusses about the new strategies to provide old-age security in low income countries. Some factors are like demographic, social, and economic transformations are responsible for changes in the patterns of vulnerability associated with old-age, and for changes in the sources of protection.
- Rajan (2006) stated about the Population Ageing and Health in India. The number of elderly in the developing countries has been growing at a phenomenal rate. With this discussed about the number of proportion of elderly, sex ratio, life expectancy at ages, Marital Status of the Elderly, Living Arrangements among the Elderly and Percentage Distribution of the Elderly by their Living Arrangements with comparison to the census data and also dependency among the Elderly with respect to social, economic, psychological and health related aspects.
- In India old-age income security is not well developed. There is one committee for examine the old-age income security and according to committee people should save their percentage of earning at younger ages which was further helping for the old age income security. On the other hand government namely the panchayats should have a decisive role in the provision of old-age income security to the poor elderly (Ahuja, 2003).
- Health problems of elderly population in Rural Areas which is considered as the closing period in the life span, as old age is connected with deterioration and changes in bodily functions and the reason for these changes is biological and environmental, socio-economic and cultural in nature. It has been found that nearly 44 percent respondents addicted to tobacco and alcohol but these practices is much among male elderly and it was the reason for several problems (Kumar, 2004)

- The Health Problems of elderly person which influenced by a number of factors like mental status, social status and decision making influence aged persons and these all are interrelated. Findings reveals that majority of the elderly, both male and female, are unhealthy. More health problems were reported by women compared to men (Balamurugan et al 2012).
- Podder (2008) mentions about the four stages of life and one of them is vanaprastha thus indicated old age- winding down social obligations. One of the vital problems of old age is loneliness. It feels unloved, unwanted and socially inadequate and they not feel the part of society. In historical period the kings are also having a problem of loneliness at the time of old age. He also studied in old age home and found that maximum aged are homeless and possess no source of income and also aged are forced by their sons and daughter-in-law to choose the home.
- All the joint families become nuclear family and the situation of elders becomes quite precarious or termed as 'Empty Nest Syndrome' but in case of Kokborok speaking people it was not changed that much. Elderly person has the attention and care by their family members. In case of decision making their role was important and indispensable and they never sit idle rather they are engaged with different works in that period also (Debbarma, 2008).

3. NEED/IMPORTANCE OF THE STUDY

There is no such kind of study related to social security for the elderly persons in rural Tripura. Some researcher tries to find out a particular problems of the elderly person like health problems, but none of them reveals about overall security of the elderly persons and what are the problems are behind this, what kind of social security facility they already have and also what are the factors are responsible for social insecurity of the elderly person.

4. OBJECTIVES OF THE STUDY

- I. To know the socioeconomic status of the elderly persons
- II. To identify the financial security of the elderly persons
- III. To find out the health security of the elderly persons
- IV. To assess the participation of elderly person in family and societal activities

5. RESEARCH METHODOLOGY

Sampling: For this study three gram panchayats were selected purposively under three blocks and the blocks are Mandai, Mohanpur and Dukli and the panchayats are respectively Chargharia, kamalghat and Belabor panchayat in west Tripura and 105 household surveys has been completed. Then the required data were collected randomly from the villages. The secondary data were collected from books, journals, literature review & different websites. List of elderly persons were collected from selected gram panchayat. The secondary data which are already available & this were drawn from the

documented official records which are already created by GP and block officials & members. The primary data were collected using interview schedules, focus group discussions (FGDs), observation method and other participatory approaches involving GP members, and GP level officials, etc. The data collected were coded, tabulated and converted into meaningful tables. Simple tables using absolute numbers, percentages, and average techniques were formulated and analyzed in a descriptive way. Graphs were also used extensively in order to make comparisons much more visible and simple.

6. RESULT AND DISCUSSION

A. Socio-economic condition of the elderly persons

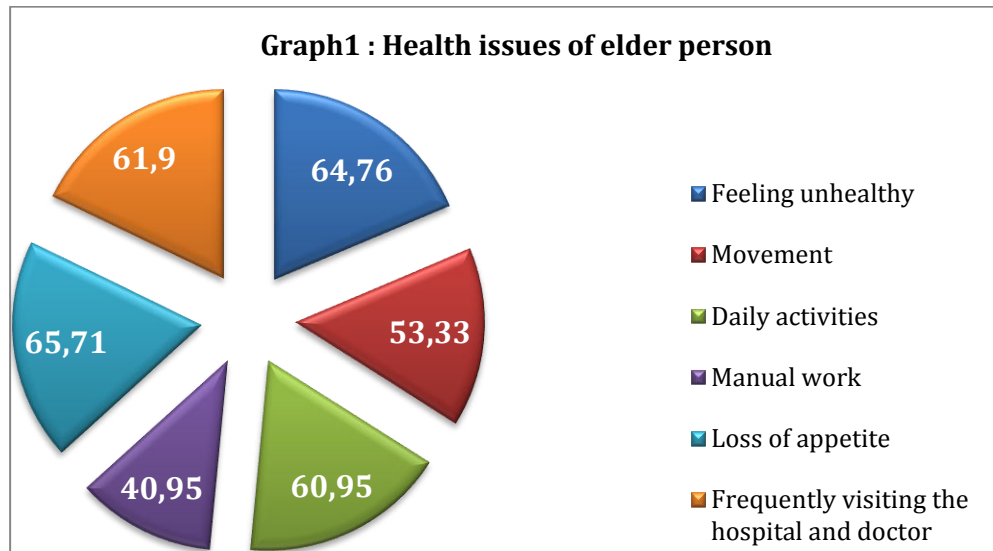
Out of 100 percent of the elderly persons 52.38 percent elderly was in the category of 60-70 years of age group while fewer people belonged to 80-90 years of age group in different villages and the male elderly (7.14 %) people outnumbered the female (42.85 %) elderly in villages. The number of illiterate elderly is high in all the villages. It was this group which is most ill-equipped to earn for livelihood except for doing unskilled/semi-skilled jobs. In all the panchayats, the occupations of the elderly were daily labourer, NREGA worker, Farmer, small business and some of them were dependent on their pension only and it may be old age pension and service pension. Elderly person have a different income sources and one of them is local wine business (14.81%) and managing by women in Mandai block. 74.29 percent elderly belongs to BPL category and old age pension facility only provided to those who belonged from BPL category whereas 2.86 percent were from Annapurna. 34.28 percent elderly person has the rights of owner of the house. Only 34.29 percent elderly were dwelling with their son and daughter in law whereas 36.19 percent elderly were dwelling with their husband.

B. Economic status of the elderly person

82.86 percent elderly person got the pension but small amount of pension was not sufficient for fulfilling their needs. Though they get the pension for their expenditure only but 49.42 percent elderly person cannot use the pension fully rather they help their children through give the money to them for completing their family needs. While only 22.85 percent elderly persons were agreed that their children helped them financially but rests were not.

C. Health status of the elderly person

Healthy ageing is a major concern in old age for all classes of people it may rural or urban. Without good health, the surviving years in the last stage of the life cycle could end up as a burden to the person himself, his family and also society. But during data collection it has been found that nobody have the health insurance and due to this they faced a several problem. Here basically try to find out a several health problems which were faced by elderly person in ageing period. Only 21.90 percent elderly person visiting the doctor for monthly check-up but the percentage of female was very less i.e. 15.55 percent. The following graph basically finds out the issues of elderly and having a various kind of problem for that.



Source: Field survey, 2015

- Maximum percentages of population were unhealthy (64.76 %) and for that moving from one place to another place was a big problem. It may be the reason of loss of appetite because 65.71 percent elderly person agreed that they faced the problem of loss of appetite.

Table 1: Different kind of health problems			
Problems	Yes	No	Total
Eye sight	61 (58.09)	42 (40)	105 (100)
Hearing	52 (49.52)	53 (50.47)	105 (100)
Hypertension	77 (73.33)	28 (26.66)	105 (100)
Insomnia	69 (65.71)	36 (34.28)	105 (100)
Respiratory tract	47 (44.76)	58 (55.23)	105 (100)
Skin disease	45 (42.86)	60 (57.14)	105 (100)
Heart burn	7 (6.66)	58 (55.23)	105 (100)
Cataract	7 (6.66)	98 (93.33)	105 (100)
Operation	5 (4.76)	100	105 (100)
Kidney	2 (1.90)	103 (98.09)	105 (100)

Source: Field survey, 2015

- Maximum elderly person facing an eye sight problem i.e. 58.09 percent. Interestingly it has been observed that 42.86 percent of aged facing a skin disease problem and maximum were from schedule tribe category.

Table 2: Reason behind the bad health condition			
Reasons	Yes	No	Total
Aged	60 (57.14)	45 (42.86)	105 (100)
Lack of healthy food	51 (48.57)	54 (51.43)	105 (100)
Lack of care taker	33 (31.43)	72 (68.57)	105 (100)
Lack of money	41 (39.04)	64 (60.95)	105 (100)
Unhygienic	67 (63.81)	38 (36.19)	105 (100)
Lack of awareness	59 (56.19)	46 (43.81)	105 (100)
Lack of available health facility in the area	50 (47.62)	55 (52.38)	105 (100)

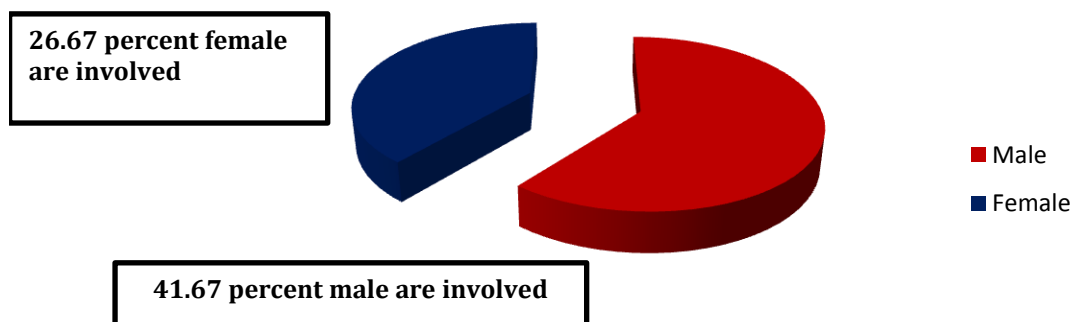
Source: Field survey, 2015

- 57.14 percent think that aged is the only reason for bad health and 47.62 percent of elderly person said that health facility was not available and also 48.57 people said that they don't effort the healthy food and it was the reason for bad health condition.

D. Condition in family and society

At the time of old age period the elderly person needed a care , support as well as attention and through following table the picture will cleared that how much and what kind support they have from family and society. After survey it has been cleared that maximum percentage of elderly (54.29 %) used a separate room and the percentage of male female was more or less same. Maximum elderly used to have meals two times (71.43 %) while only 20.95 percent elderly agreed that that they took the meal three times.

Graph 2 :Involvement in decision taking of the family



Source: Field survey, 2015

- Graph 2 says that only 35.23 percent elderly male, female have the part of decision making and rests were not taking any kind of decision. Apart from this, 78.09 percent agreed that they have available electric equipments like light and fan in their room but rests does not have any facility.

Maximum number of elderly persons visiting the temple and the percentage of female was more (64.44 %) compare to male. Only 28.33 percent male members were engaged with several committees and it was common in tribal society.

Table 3: Societal support system for the aged in before and after 60 years

Particular	Yes	No	Total
Respect from peer group	44 (41.90)	61 (58.09)	105 (100)
Respect from young adults	26 (24.76)	79 (75.24)	105 (100)
Responsibility of society	17 (16.19)	88 (83.80)	105 (100)
Decision taker	30 (28.57)	75 (71.43)	105 (100)
Involvement in different societal phenomena	33 (31.43)	72 (68.57)	105 (100)

Source: Field survey, 2015

- 51.43 percent aged agreed that the before attaining 60 years they had more social support in comparison to present situation but this was more in tribal society. Only 24.76 percent elderly person agreed that young adults were respecting them.

7. RECOMMENDATION

- ❖ **Financial security:** Old age pension benefit should be extended to all rural poor households not only for selective and BPL households and if possible increase the amount of the pension because the pension is not sufficient for fulfilling the needs of the elderly person. On the other way panchayat should coming forward and give the responsibility to the elderly for monitoring the various communities work?
- ❖ **Health security:** In every district should open a hospital with a special Geriatric ward for the elderly person. Special OPD services for senior citizens in each hospital. In order to improve the health status of the elderly population, it is important to engagement with the different kind NGOs and arranging several awareness campaigns for free check-up.
- ❖ **Family and societal support:** People's attitude towards silvers should be changed. People should respect them as one of the important person of family as well as society like our parents and close relatives. If possible family members of the elderly persons may be also given counselling about the ways of 'how to deal' with the elderly person.
- ❖ At the time of old age period elderly person need a care, support as well as attention but when they are staying in separate room then they don't have a sufficient attention. So if

possible their room should be attached with the main rooms of the house. While during survey it has been cleared that they don't want to stay alone in the room. Maximum wants to stay with their granddaughter and grandson.

- ❖ In every school moral education should be introduced for minimizing the problems of elderly persons because modern education cannot make a child a human being, they grow into automatons for earning money not respect the elders.

8. CONCLUSIONS

The elderly person (60+) represents 8.58 percent of the total population and most of them are below the poverty line. Family and societal support are two important things for the elderly persons. At the old age period they need more attention and care. But due to insufficient care and attention they feel insecure and mentally disturbed. The findings of this study enlighten the present status of the elderly persons, financial security of the elderly persons, health security of the elderly persons and perception of elderly person regarding societal and family support. Finally, the results of the study explain the requirement of the government to formulate policies that concentrate on these problems.

9. LIMITATIONS

- i. Proper index was not used for measuring the perception of societal and family support of the elderly person.
- ii. Lack of time for data collection.
- iii. Lack of study related to Tripura.

10. SCOPE FOR THE FURTHER RESEARCH

- i. In depth study can be done to find out the factors of social insecurity among the elderly persons.
- ii. The study can be done for other districts of the state using assessment tool (index).

11. REFERENCES

- [1] Ahuja, R. (2003). Old-Age Income Security for the Poor. Available at url: <http://kapz77.tripod.com/paper/rajeevahuja.pdf>. Accessed on date: 7.8.2014.
- [2] Balamurugan, J., & Ramathiratham, G. (2012). Health Problems of Aged People. IJRSS. Volume 2, Issue 3. ISSN: 2249-2496
- [3] Barrientos, A. (2007). New strategies for old-age income security in low income countries. Technical Report 12. International Social Security Association.
- [4] Debbarma. (2008). Elderly People in the Tribal Society of Tripura-a case study of the Kokborok Speaking People. In Majumder, B.C & Saha, P (Eds.), Ageing in North East India (pp.39-46). Akansha Publishing House.
- [5] Government of India Planning commission. (2001). Report of the working group on social security, Tenth five year plans. Available at url: http://planningcommission.nic.in/aboutus/committee/wrkgrp/wg_soclscty.pdf. Accessed on date: 12.11.14
- [6] Kumar, P. (2004). Health Problems of Rural Aged: A Social work Intervention. Indian Journal of Research. Volume, 3 Issue 6. ISSN - 2250-1991

- [7] Poddar, S. (2008). Problem of loneliness among the elderly persons of Tripura. In Majumder.B.C & Saha, P (Eds.), Ageing in North East India (pp.23-38).Akansha Publishing House.
- [8] Rajan, I.S. (2006).Population Ageing and Health in India. The Centre for Enquiry into Health and Allied Themes (CEHAT), Mumbai.
- [9] Samanvay.Department of Rural Development, Ministry of Rural Development, Government of India & National Institute of Rural Development and Panchayati Raj. Hyderabad
- [10] Subrahmanya, R.K.A. (2005). Social Security for the Elderly in India. In Subrahmanya, R.K.A (Eds.), Social Security for the Elderly. Shipra Publication.
- [11] World Social Security Report. (2010-11) .Coverage by social security pensions: Income security in old age. (pp. 45). ILO Publications.

Electrical Energy Management In Distribution Sector Using Conductor Grading And Feeder Reconfiguration

Paper ID	IJIFR/V3/ E9/ 055	Page No.	3438-3447	Subject Area	Electrical Engineering
KeyWords	Electrical Energy Management, Distribution Sector, AT&C Losses, Technical Loss, Feeder Reconfiguration, Loss Minimization, Conductor Grading				

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Abstract

In the present scenario of energy crisis, electrical energy management becomes an unavoidable aspect in power system, particularly in distribution sector. This is due to the fact that energy losses in distribution sector is much more than any other power sector, especially as it deals with low voltages. In this paper, two loss minimization techniques have been proposed for electrical energy management i.e. conductor grading and feeder reconfiguration, in order to efficiently mitigate the energy losses in distribution sector. A test area in Rajasthan, India, has been considered for implementing the proposed techniques and their respective outcomes have been discussed.

1. INTRODUCTION

In today's world, one of the most alarming concerns is non-availability of sufficient energy and power shortage has become a pressing issue in the day to day life. Huge amounts of costs are incurred for meeting the ever escalating energy demands, putting massive financial burden on the already struggling economies. A lot of technological

investment and effort is put into alleviating these issues by saving the available energy and utilize it as efficiently as possible. In this regard, the concept of electrical energy management assumes great importance in power system, since an efficient usage of electrical energy would minimize the requirement of any additional investment to generate the extra energy for meeting the energy demand. The research in this area is also shows that it is better to save energy than generate extra [1]. So, the prospect of energy management is most required and inevitable in the distribution sector especially, considering the high degree of energy losses in the sector.

The distribution system provides the link between the transmission system and the consumers. The distribution system has to be efficient, designed for the optimized utilization of electrical energy. However, as the number of end users grows in an unplanned manner, the distribution infrastructure is readjusted, often unscientifically, in order to meet the fast growing demand as soon as possible. This approach usually causes compromise with the efficacy of the originally designed system. Therefore, the AT&C losses i.e. aggregated technical and commercial losses would increase and the reliability of power supply decreases. Also, the financial liabilities on the utility end rise due to this [2]. Another reason for this illness of distribution system is the conventional power flow methods as Newton-Raphson and Gauss-Seidal etc. are not efficient due to high R/X ratio and are used to solve linear, continuous system but the distribution system is nonlinear in nature [3, 4]. Therefore, as the most viable solution for this problem, there is a strong need for employing loss minimization techniques to improve the efficiency distribution sector.

2. AT&C LOSSES

Aggregated Technical and Commercial losses (AT&C losses) can be defined as the difference between the energy given to the network i.e., the electrical input energy and the electrical energy sold, accounted in the form of billing.

$$\text{AT\&C Losses} = \text{Energy Input} - \text{Energy Sold}$$
$$\% \text{ AT\&C Losses} = \frac{(\text{Energy Input} - \text{Energy Sold})}{\text{Energy Input}} \times 100$$

These losses include both types of losses i.e. technical as well as non-technical losses.

I. Technical Losses

Technical losses in any electrical power system are inherent because of the well-known Joule Effect occurs in line and transformers since the resistance present in the conductors and electrical devices. When electric current flow through them, power losses occur in the form of heat. In distribution system, the bulk of the technical losses occur in transformers and the distribution lines [5].

Technical losses can be further classified as fixed losses and variable losses. Fixed losses doesn't vary with changes in load current and are mainly caused by the energizing the transformer core, due to leakage current and loss in dielectric material inside the transformer. Variable losses depend upon the load current and are proportional to the square of current, hence called I^2R losses. Fixed losses are much smaller in magnitude

when compared to the variable losses, which form the majority of the technical losses. Some of the popular methods for reducing the variable losses are conductor grading, feeder re-configuration, capacitor bank instalment, distributed generation etc.

II. Commercial Losses

Commercial losses are also known as the non-technical losses. The main cause of these losses is electricity theft. The other reasons are defective meters, meter tampering, error in taking meter reading etc. This means that lack of an efficient metering system would increase the commercial losses.

3. CONDUCTOR GRADING

The major contribution to technical losses is the I^2R losses occurring in the lengthy distribution lines due to the Joule Effect. When the conductor resistance is more, power losses would also be more. Since resistance depends on the length and area of cross-section of the conductor, proper selection of the conductor size at suitable lengths is very important. Another issue is that in some areas of the distribution network, the conductor used would be overloaded since the current flowing through that conductor is more than the current bearing capacity of that conductor [6]. Hence more heat loss occurs. This energy loss gets decreased as the conductor size increases (since resistance get decreases) but increased conductor size means increased initial cost. As all type of conductors have their specific feature such as resistance value, maximum current carrying capacity and the cost [7]. Therefore, optimal length and sizing of the conductor should be adopted in such a way that the cost saving is maximized due to reduced energy losses and at the same time the initial investment is minimized.

In conductor gradation technique, conductor replacement is considered by assessing the current carrying capacity of the conductor. For this purpose, the branch current between the nodes of the feeder is calculated and check is performed on the existing conductor as to whether it is capable of bearing that much load or not. If not, then it means the conductor is currently overloaded and needs to be replaced with a suitable conductor having higher rating and size. Another advantage of this method is it enhances the loading capacity of the distribution feeder along with the power loss minimization. The conductor should be loaded maximum 85% only, because if loading will be 100% then at time of fault conductor will be burnt out [8].

A study has been performed to analyse the effectiveness of conductor grading in minimising distribution losses and for this purpose, a test case has been considered which is the 11 kV Deetyakhedi feeder in the distribution network of Jhalawar circle at Piplod GSS (i.e. Grid Sub-Station), in the Rajasthan state, India, maintained by Jaipur Vidhyut Vitran Nigam Ltd. The single line diagram of the feeder is shown in figure 1.

The details of the feeder have been listed in table 1 and the monthly load pattern is shown in figure 2

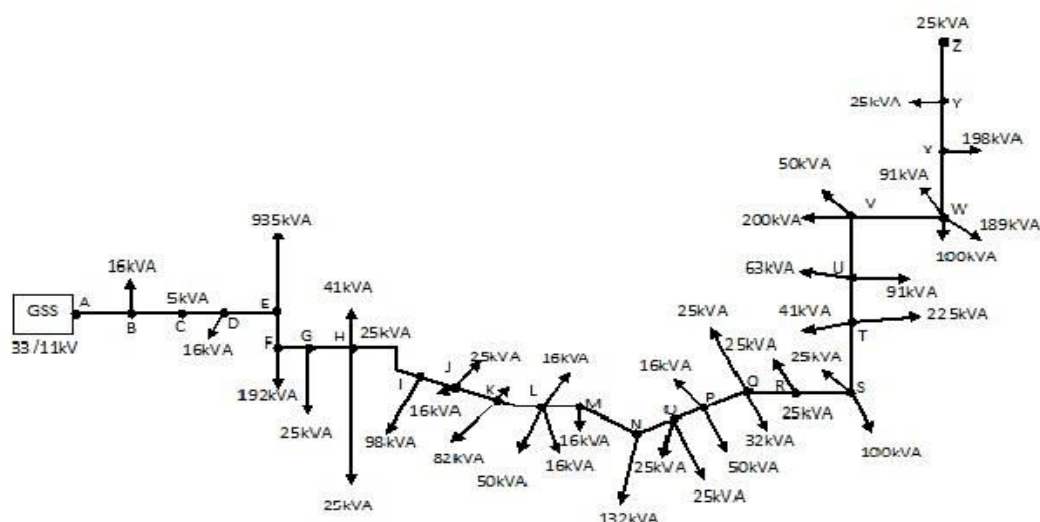


Figure 1: Single Line Diagram of 11 kV Deetyakhedi Feeder.

Table 1: Details of Deetyakhedi Feeder.

1	Type of Feeder	Rural
2	Length of the Feeder	10.5 km
3	Conductor type used in Feeder	Weasel Conductor
4	Electrical Energy Input	670591 kWh/month
5	Electrical Energy Sold	402354kWh/month
6	Loss Unit	268237kWh/month
7	Percentage of Total Losses	40 %
8	Percentage of Technical Losses	17 %
9	Percentage of non-technical Losses	23 %
10	Percentage of Transformer Losses	4%
11	Percentage of Line Losses	13%
12	Percentage of Voltage regulation	16.7%

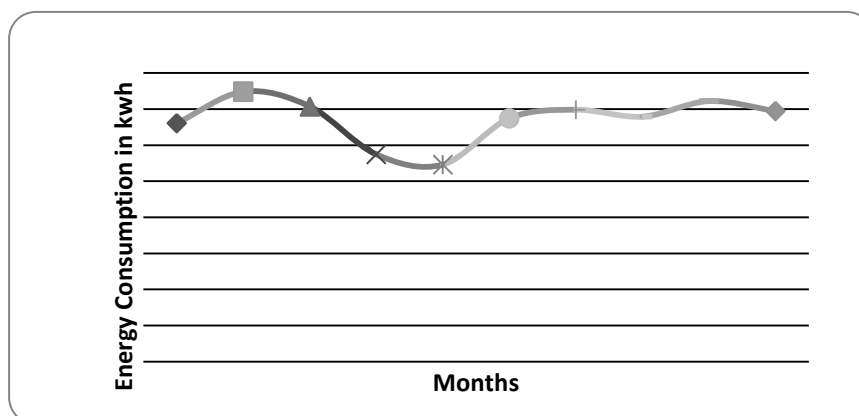


Figure 2: Monthly Load Pattern of 11 kV Deetyakhedi Feeder.

In Deetyakhedi feeder shown in Fig.1, current at point F is 139 amperes which is the maximum current carrying capacity of weasel type conductor which means it can be considered as a case of marginal overloading. Any expansion in the future would increase the overload. The maximum current (which is more than 139 ampere) in this section is at point A. Hence the weasel conductor from point A to F i.e. the conductor for a length of 3.64 km originating from substation can be replaced with dog type conductor (maximum 300 ampere) because if we Considering future expansion of load. The feeder configuration after the conductor replacement is shown in figure 3 (with the replaced section in red colour).

After the deployment of conductor of proper grade (dog type), the losses are recalculated.

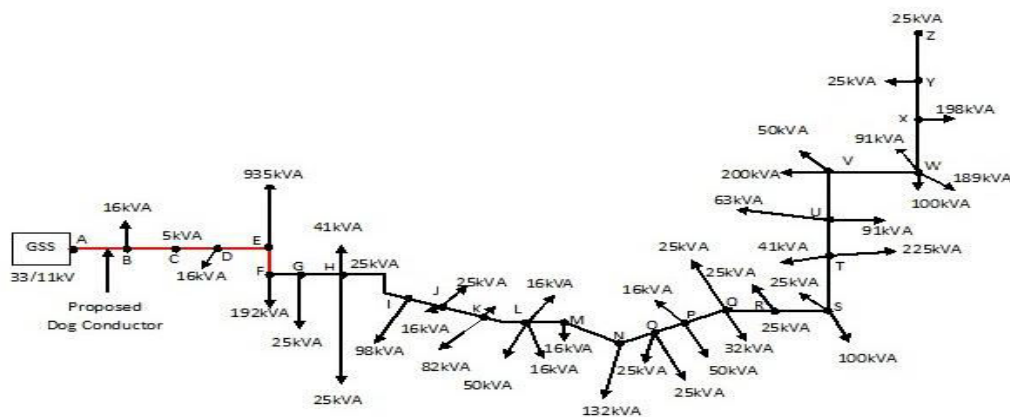


Figure 3: Single Line Diagram of 11 kV Deetyakhedi Feeder after Conductor Grading.

From figure 4, it can be seen that the line losses without conductor grading was 13% and the losses have been brought down to 6.2% (almost as half as the original losses) after conductor grading.

Hence,

Reduction in loss = 6.8%

Percentage of total losses after conductor grading = 33.4%

Saving in unit per month after conductor grading = 43732 kWh/month

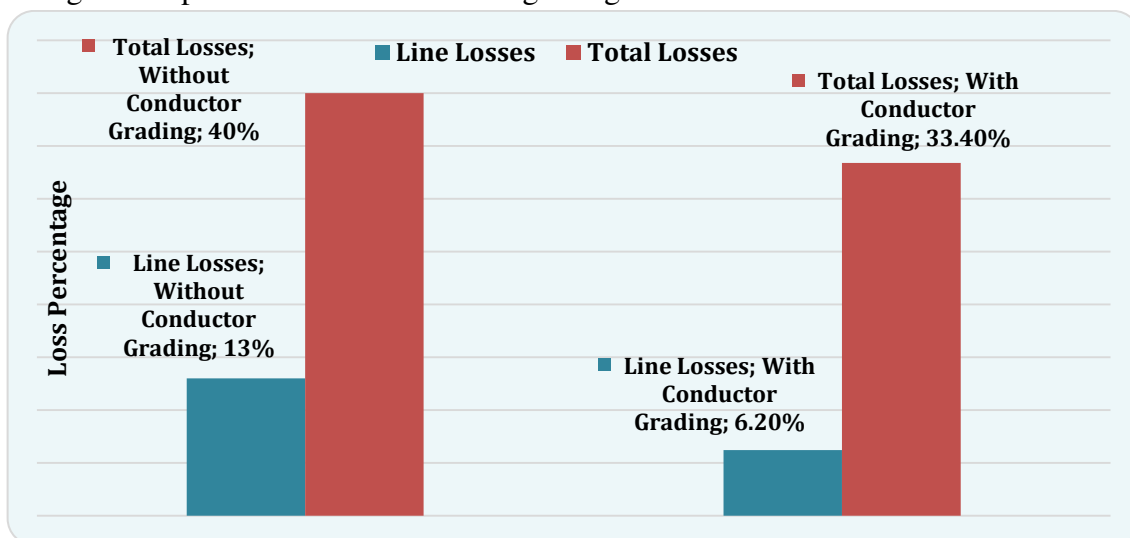


Figure 4: Percentage of losses with and without Conductor Grading.

The outcome of the cost benefit analysis performed on the feeder in the case of conductor grading is as follows.

Total investment on conductor grading = 8, 67,025 Rs.

Cost of retrieved conductor (considering scrap value at 50% of new conductor) = 1, 30,309 Rs.

Labour cost at 15% of material cost for the construction and dismantling of line = 1, 49,600 Rs.

Net investment = 8, 86,315 Rs.

Unit cost of the sale = 4.07 Rs. per unit (as per JVVNL rates)

Total saving = 1, 77,989 Rs. per month

Payback period = 4.97 months

Since the investment cost will be recovered in only 4.97 months, conductor grading is a viable option for this feeder both from economical point of view and from energy saving point of view.

4 FEEDER RECONFIGURATION

In the distribution system, the transmitted power is stepped down at the distribution substation and then fed to the distribution transformer through feeders and finally to the consumer. If the length of the feeder is more, the power losses will be more and therefore, the voltage regulation will be high which means the last consumer in the network will get the lowest voltage. In feeder reconfiguration technique, a big feeder is divided into smaller feeders appropriately so that the losses in the existing feeder get reduced by some extent. By using this technique, the current flowing in existing feeder will be reduced as it divides among the sub-feeders. So this method alters the loading level of the feeders, improves the voltage profile and along with these reduces the losses also. Feeder reconfiguration is subjected to some constraints such as capacity of transformer, voltage drop, feeder thermal capacity and radiality of network [10]. The methods of reconfiguration can be divided into 3 main categories: heuristics and optimization techniques which are time consuming for the large distribution system so these are not practical one; purely heuristics where the optimization is not guaranteed since the algorithms are used for local optimization; modern heuristics where artificial intelligence is used in the algorithms such as genetic algorithm[11],honey bee mating optimization[12], particle swarm optimization, hyper cube ant colony optimization etc. These algorithms require less computational time compare to conventional methods and gives high degree of accuracy [13].

For the analysis of this technique, the same test area has been considered which consists of Deetyakhedi feeder. Taking into account the economic aspects, simplicity and advantages of double circuit line, for the feeder reconfiguration a double circuit line is proposed as by using this reliability of network get improves [9]. For reconfigure the Deetyakhedi Feeder double circuit line from point A to S which is 7.35km from the GSS (to bring voltage regulation within permissible limit i.e. 8%) is constructed. The newly constructed line from point S is connected at point T so the load from point T to Z would be fed from

newly constructed feeder and cut the old existing feeder at point S so the load between the point A to S would be fed from old existing feeder. By using this technique the total one feeder will be divided into two parts as

Feeder 1: old existing line from A to S (2079 kVA)

Feeder 2: Newly constructed line from A to Z via point S (1298 kVA)

The single line diagram of the feeder after reconfiguration has been shown in figure 5.

The line losses have been reduced to 7.05% from 13 % after the proposed feeder reconfiguration is employed as can be seen from figure 6.

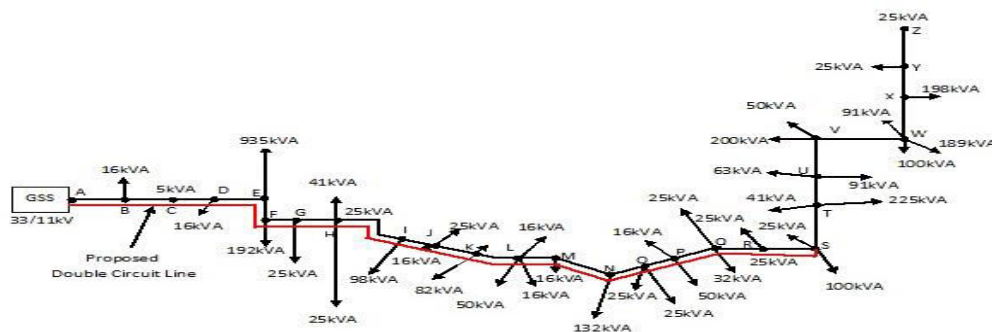


Figure 5: Single Line Diagram of 11kV Deetyakhedi Feeder After Feeder Reconfiguration.

Reduction in line losses = 5.95%

Percentage of total losses after feeder reconfiguration=34.32%

Voltage regulation of feeder1 old one (i.e. from point A to S) = 7%

Voltage regulation of feeder 2 new one (i.e. from point A to Z via point S) =9%

It is clear from the analysis that the voltage regulation get improves from 16.7% to 7% and 9% respectively which somewhat nearer to the standards i.e. maximum allowed voltage regulation for 11kV.

The outcome of the cost benefit analysis performed in the case of feeder reconfiguration is as follows.

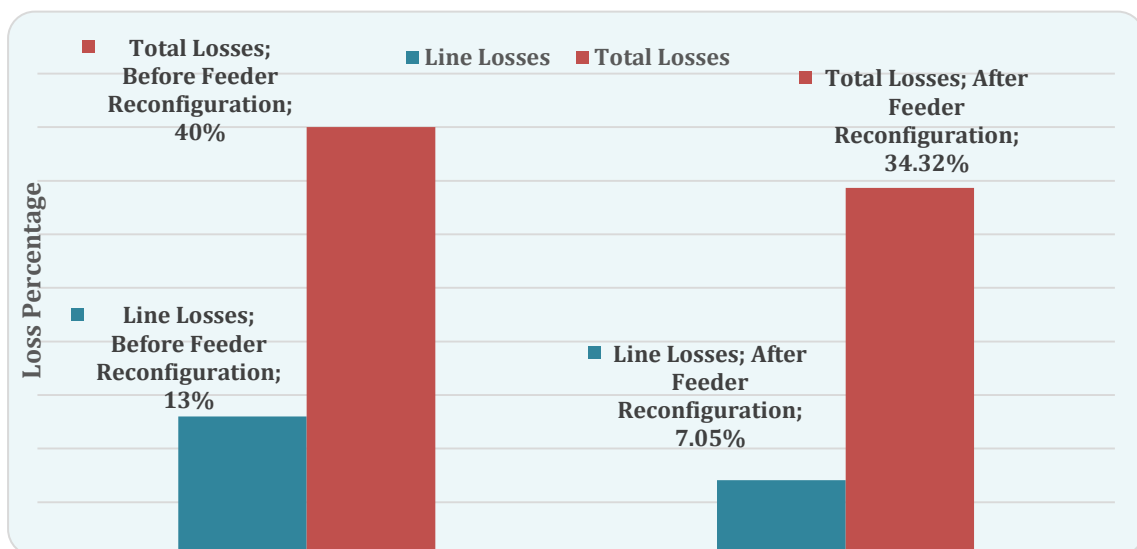


Figure 6: Percentage of losses with and without Feeder Reconfiguration

Total investment on feeder reconfiguration = 6, 94,088 Rs.

Cost of retrieved material = 10,625 Rs.

Labour cost at 15 % = 1, 05,706.75 Rs.

Net investment = 7, 89,170 Rs.

Total saving = 1, 54,904 Rs. per month

Payback period = 5.08 months

The payback period is only around 5 months which make feeder reconfiguration suitable technique for loss minimization in the distribution system.

5. CONCLUSION

The distribution system has been identified as one of the areas in power system where a major share of power loss occurs owing to poor network design, over utilization of the existing infrastructure and various other reasons. In this paper, two loss minimization techniques, i.e., conductor grading and feeder reconfiguration, were considered as suitable solutions for these issues thereby improving the operating conditions of distribution network. For implementing these techniques, the 11 kV Deetyakhedi feeder in Rajasthan, India, has been considered as the test area. Each of the two techniques were separately employed and the results were examined and cost benefit analysis was performed for each case. From the investigation results, it has been concluded that both methods are effective in reducing the technical losses by good extents. Also the payback periods of both the methods were found to be favourable and hence both are economically viable options for electrical energy management in distribution sector. The results of both the techniques were in much congruence and this may be attributed to the similarity in the assumptions made for either cases. The energy saved by these loss minimization techniques can be further utilized further to fulfil the demand in the system. The system performance will clearly improve and the overall efficiency of the system will increase. Although both techniques yield satisfactory results, conductor grading method would be more suitable for the test area since it requires relatively lesser investment as well as lesser efforts to implement the modifications in terms of introducing a conductor of proper grade.

6. ACKNOWLEDGMENT

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7. REFERENCES

- [1] G. B. Dabre, A. A. Dutta and A. N. Kadu. "Performance evaluation of distribution network and reduction in technical & non-technical losses by using energy efficient equipment and cost benefit analysis in the power sector." In *Power, Automation and Communication (INPAC), 2014 International Conference on*, pp 6-11. IEEE, 2014.
- [2] S. Kalambe and G. Agnihotri. "Loss minimization techniques used in distribution network: bibliographical survey." *renewable and sustainable energy reviews* 29 (2014):pp 184-200.

- [3] V.C. Veera Reddy, N. Perumal and Y. Rajasekharareddy. "Loss reduction in distribution networks by network reconfiguration: a two stage solution approach." In *Power and Energy Conference, 2004. PECon 2004. Proceedings. National*, pp 241-246. IEEE, 2004.
- [4] K. Sathish Kumar and T. Jayabarathi. "Power system reconfiguration and loss minimization for an distribution systems using bacterial foraging optimization algorithm." *International Journal of Electrical Power & Energy Systems* 36, vol.1 (2012): pp 13-17.
- [5] G. Francisco Montoya, R. Baños, C. Gil, A. Espín, A. Alcayde and J. Gómez. "Minimization of voltage deviation and power losses in power networks using Pareto optimization methods." *Engineering Applications of Artificial Intelligence* 23, vol. 5 (2010): pp 695-703.
- [6] S. Naveen, K. Sathish Kumar and K. Rajalakshmi. "Distribution system reconfiguration for loss minimization using modified bacterial foraging optimization algorithm." *International Journal of Electrical Power & Energy Systems* 69 (2015): pp 90-97.
- [7] M. Vahid, N. Manouchehr, S. Dehaghan Hossein and A. Jamaledin. "Combination of optimal conductor selection and capacitor placement in radial distribution systems for maximum loss reduction." In *Industrial Technology, 2009. ICIT 2009. IEEE International Conference on*, pp 1-5. IEEE, 2009.
- [8] S. Ghosh and U. S. Chhatwal. "Enhancement of Loading of Radial Distribution Networks Using Optimal Conductor Size." *International Journal of Computer and Electrical Engineering* 1, vol. 2 (2009): pp 126.
- [9] D. L. Duan, Dong-Li, X. D. Ling, X. Y. Wu and B. Zhong. "Reconfiguration of distribution network for loss reduction and reliability improvement based on an enhanced genetic algorithm." *International Journal of Electrical Power & Energy Systems* 64 (2015): pp 88-95.
- [10] Y. Abdelaziz, S. M. Elkhodary and R. A. Osama. "Distribution networks reconfiguration for loss reduction using the Hyper Cube Ant Colony Optimization." In *Computer Engineering & Systems (ICCES), 2011 International Conference on*, pp 79-84. IEEE, 2011.
- [11] G. L. Storti, F. Possemato, M. Paschero, A. Rizzi and F. M. Frattale Mascioli. "Optimal distribution feeders configuration for active power losses minimization by genetic algorithms." In *IFSA World Congress and NAFIPS Annual Meeting (IFSA/NAFIPS), 2013 Joint*, pp 407-412. IEEE, 2013.
- [12] J. Olamaei, T. Niknam and S. Badali Arefi. "Distribution feeder reconfiguration for loss minimization based on modified honey bee mating optimization algorithm." *Energy Procedia* 14 (2012): pp 304-311.
- [13] T. T. Nguyen and Anh Viet Truong. "Distribution network reconfiguration for power loss minimization and voltage profile improvement using cuckoo search algorithm." *International Journal of Electrical Power & Energy Systems* 68 (2015): pp 233-242.
- [14] C. T. Su and C. S. Lee. "Feeder reconfiguration and capacitor setting for loss reduction of distribution systems." *Electric power systems research* 58, vol. 2 (2001): pp 97-102.
- [15] M. Vahid, A. A. Hossein and M. Kazem. "Maximum loss reduction applying combination of optimal conductor selection and capacitor placement in distribution systems with nonlinear loads." In *Universities Power Engineering Conference, 2008. UPEC 2008. 43rd International*, pp 1-5. IEEE, 2008.
- [16] S. Jazebi and B. Vahidi. "Reconfiguration of distribution networks to mitigate utilities power quality disturbances." *Electric Power Systems Research* 91 (2012): pp 9-17.

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Simulation Of Potential And Electric Field Distribution For Different Parts Of Insulator Using Finite Element Method

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Abstract

Computation of potential and electrical field strength along the insulator strings is an important aspect for their designs. Similar with porcelain insulator strings, the axial potential distribution of composite insulator strings is non-uniform. Based on the characteristics of capacitive electric field distribution of composite insulators, this paper presents a new measure to improve electric field distribution based Ceramic insulators are widely used in power transmission lines to provide mechanical support for High voltage conductors in addition to withstand electrical stresses. As a result of lightning, switching or temporary over voltages that could initiate flashover under worst weather conditions, and to operate within interference limits. Given that the useful life in service of the individual insulator elements making up the insulator strings is hard to predict, they must be verified periodically to ensure that adequate line reliability is maintained at all times Due to deficiency of electric field data for the existing string configuration, utilities are forced to replace the discs

which may not be essentially required. Hence, effort is made in the present work to simulate the potential and electric field along the normal and with faults induced discs. This study is concerned with the voltage and the electric field distribution on a ceramic disc insulator of insulator type suspension strings composed of cap and pin type porcelain insulators. It's one of the main structure utilize for the better operation of insulator. Finite Element Method based software, CATIA and HYPERMESH, was used three dimensional modeling and simulations.

1. INTRODUCTION

Control of electrical field distribution within and around high voltage equipment is one of the basic aspects of the design of such equipment. Audible noise, radio noise, partial discharges and corona discharges are some of the possible results of high level electrical fields. Modern society exclusively depends on the electrical power for industrial, commercial, agricultural, domestic and social purposes. The electrical energy is generated mainly at the hydro, thermal and nuclear power stations. Due to various reasons, the generating stations and the load centers are geographically far off, which necessitates transmission of bulk power over long distances. This important task at present is mostly performed by overhead power transmission lines. Currently, underground transmission is also employed however; capacitive charging current of the cable limits its application to shorter distances. In a dry and clean state, the voltage distribution of a composite insulator string is characterized by a capacitive distribution. According to Kirchhoff's law, if a composite insulator circuit is placed in a series with capacitors, resistors, or inductors, the voltage of the composite insulator can be assumed to be significantly improved.

2. IDENTIFICATION OF NUMERICAL TECHNIQUES

Due to the sensitivity of insulating materials to electric field, accurate determination of electric field is necessary while designing and diagnostics of high voltage apparatus. Various numerical methods have been employed over the years for the computation of the electric potential and field along the insulator string. Basically there are two methods, Domain based methods and Boundary based methods. Finite Difference Method (FDM) and Finite Element Method comes under Domain based methods, and Boundary based methods includes Boundary Element Method (BEM), Charge Simulation Method (CSM) and Surface Charge Simulation Method (SCSM).

3. DESCRIPTION OF EXISTING PROBLEMS

Although the EFPD along the ceramic insulators has been widely studied for a long time, the results of these studies cannot be applied directly to the real power line insulators. The limitations of the previous studies are: The analysis of the EFPD along ceramic insulators usually assumes single phase energization. However, a real power line means three phase energization, and the presence of the other two phases may have some influence on the EFPD along a ceramic insulator.

4. LAPLACE EQUATION AND MODEL

Calculation of electric fields requires solution of Laplace's eqn. and Poisson's equation eqn. with boundary conditions satisfied. This can be done either by analytical or numerical methods.

$$\nabla^2 \varphi = -\rho/\epsilon_0 \quad (1)$$

$$\nabla^2 \varphi = 0 \quad (2)$$

In eqns. the operator ∇^2 is called the laplacian and is a vector with properties

$$\nabla \cdot \nabla = \nabla^2 = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2} \quad (3)$$

The energy per unit length associated with the element is given by the following equation:

$$W_e = 1/2 \epsilon [Ve]^T [C^{(e)}] [Ve] \quad (4)$$

Where, T denotes the transpose of the matrix

$$[Ve] = \begin{bmatrix} Ve1 \\ Ve2 \\ Ve3 \end{bmatrix} \quad \text{And} \quad [C^{(e)}] = \begin{bmatrix} C_{11}^{(e)} & C_{12}^{(e)} & C_{13}^{(e)} \\ C_{21}^{(e)} & C_{22}^{(e)} & C_{23}^{(e)} \\ C_{31}^{(e)} & C_{32}^{(e)} & C_{33}^{(e)} \end{bmatrix} \quad (5)$$

5. DIMENSIONS OF INSULATOR AND SIMULATION

Insulators used for high-voltage power transmission are made from glass, porcelain, or composite polymer materials. Porcelain insulators are made from clay, quartz or alumina and feldspar, and are covered with a smooth glaze to shed water. Insulators made from porcelain rich in alumina are used where high mechanical strength is a criterion. Porcelain has a dielectric strength of about 4–10 kV/mm.

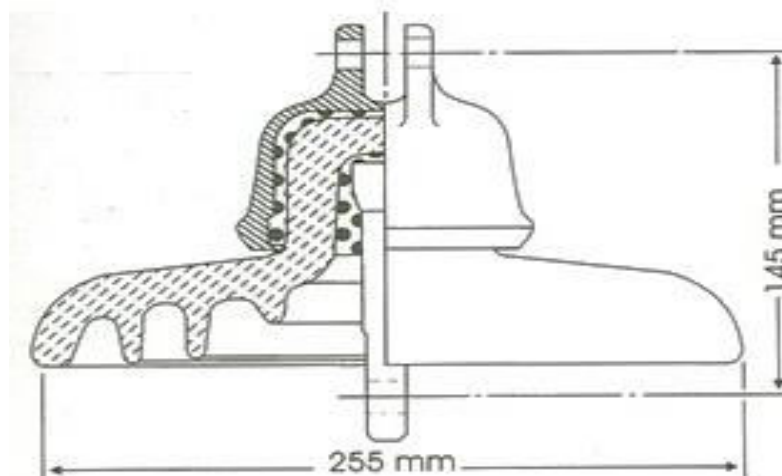


Figure 5.1: Dimensions of Ceramic Disc Insulator

The design of cap and pin type ceramic insulator essentially consists of a malleable/ductile iron cap, malleable/forged iron pin and a ceramic/porcelain shell. The cap and pin of the insulator is fixed to the ceramic shell with the help of a Portland cement. A bituminous coating is applied to the pin to prevent corrosion. The dimension of insulator used are given for each model in the CATIA models as shown in Figure 5.2

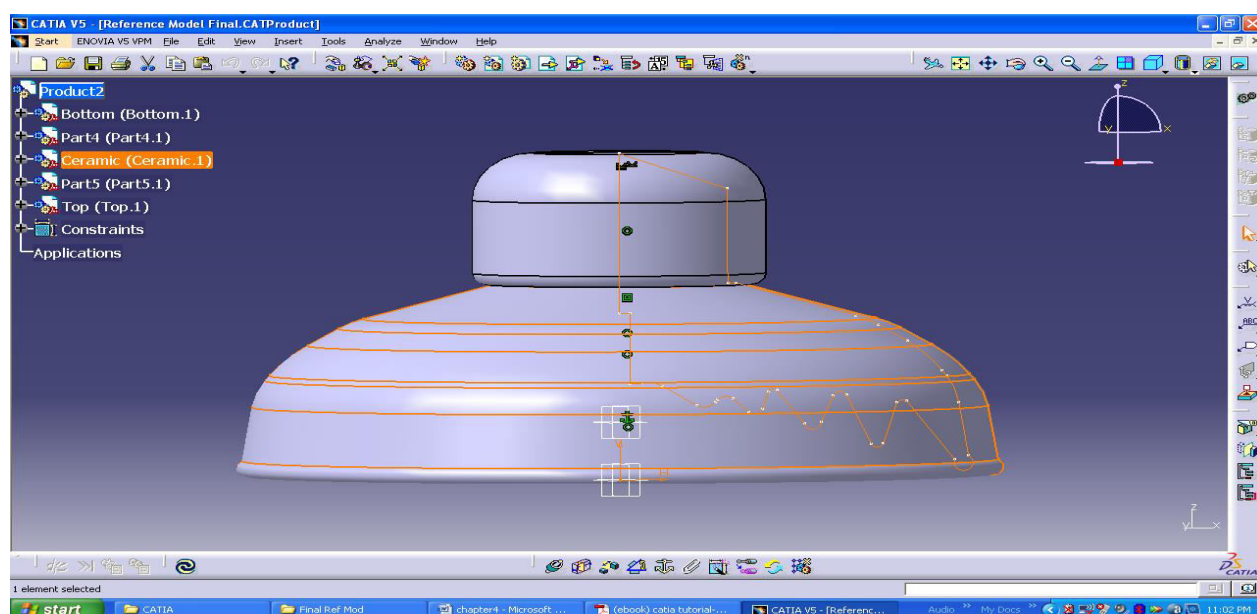


Figure 5.2: Dimension of insulator in CATIA

Table 5.1: Details of materials used for Insulator

Sl. No	CATIA models parts No.	Material model no	Voltage on nodes(volts)
1	Part1 (Cap of insulator)	Material model 1 (ground end)	0v
2	Part2 (Binding cement)	Material model 2 (Cement part)	-
3	Part3(Ceramic surface)	Material model 3(Disc part)	-
4	Part4(Pin of insulator)	Material model 4(Pin part)	11kv
5	Part5 (air part)	Material model 5(air part)	-

Altair Hyper View is a complete post-processing and visualization environment for finite-element analysis (FEA), multi-body system simulation, video and engineering data. Hyper View can visualize data interactively, as well as capture, standardize and automate post-processing activities.

Hyper View also saves 3D animation results in Altair's compact H3D format. This enables users to visualize and share CAE results within a 3D web environment and Microsoft PowerPoint. The model of insulator after importing in the HYPERMESH is as shown in

Fig.5. Details of material type, relative permittivity of different parts of the modeled insulator, the model of insulator after importing in the HYPERMESH.

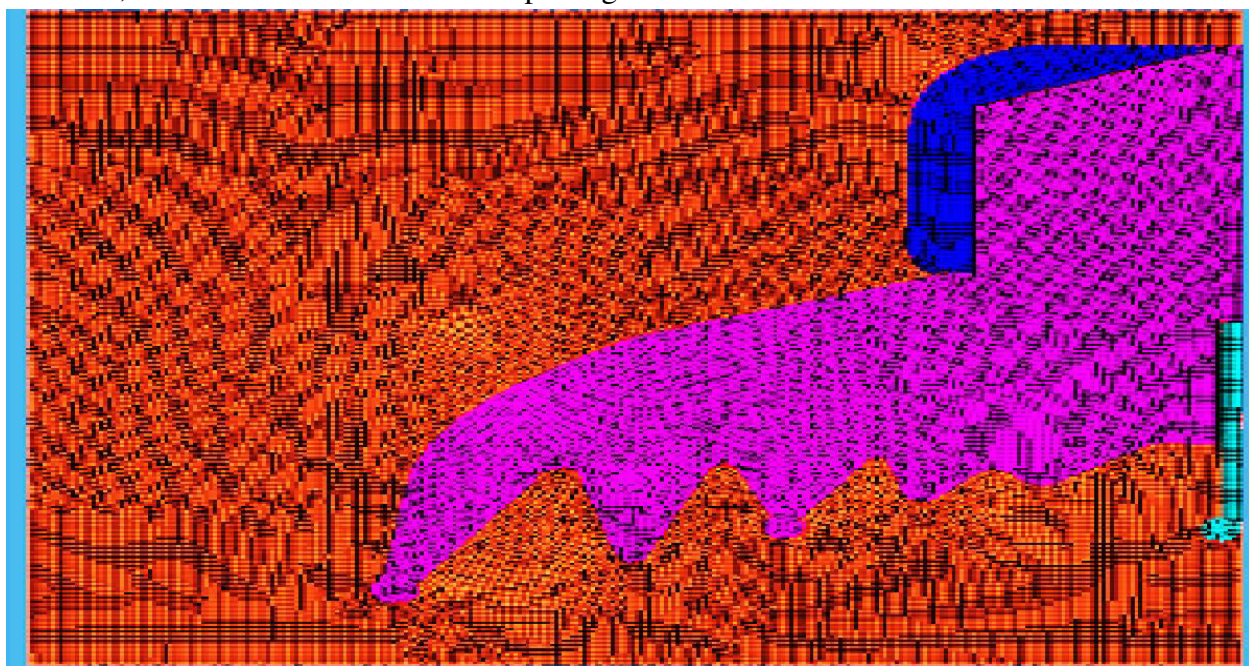


Figure 5.3: Model of insulator after importing in the HYPERMESH

The contour plots of potential and field distributions of standard ceramic insulators are shown in Figure 5.4. Potential distribution of standard normal type ceramic insulator

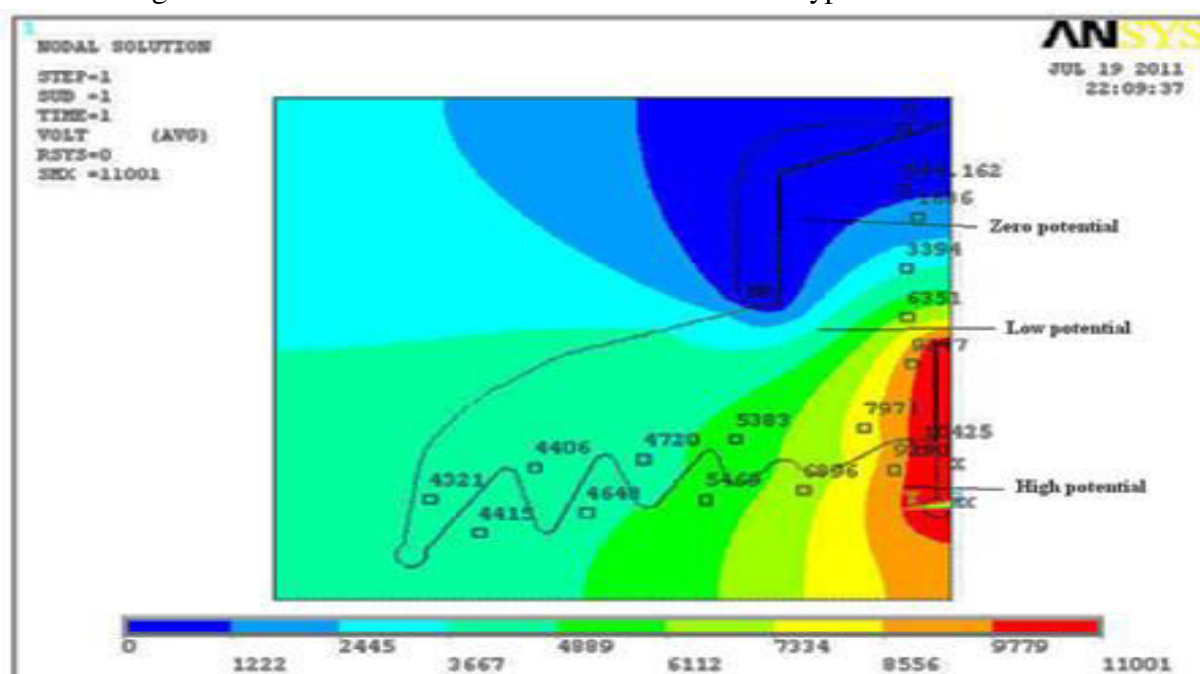


Figure 5.4: Potential distribution in ANSYS

Electric field distribution of standard normal type ceramic insulators is shown in Figure 5.5

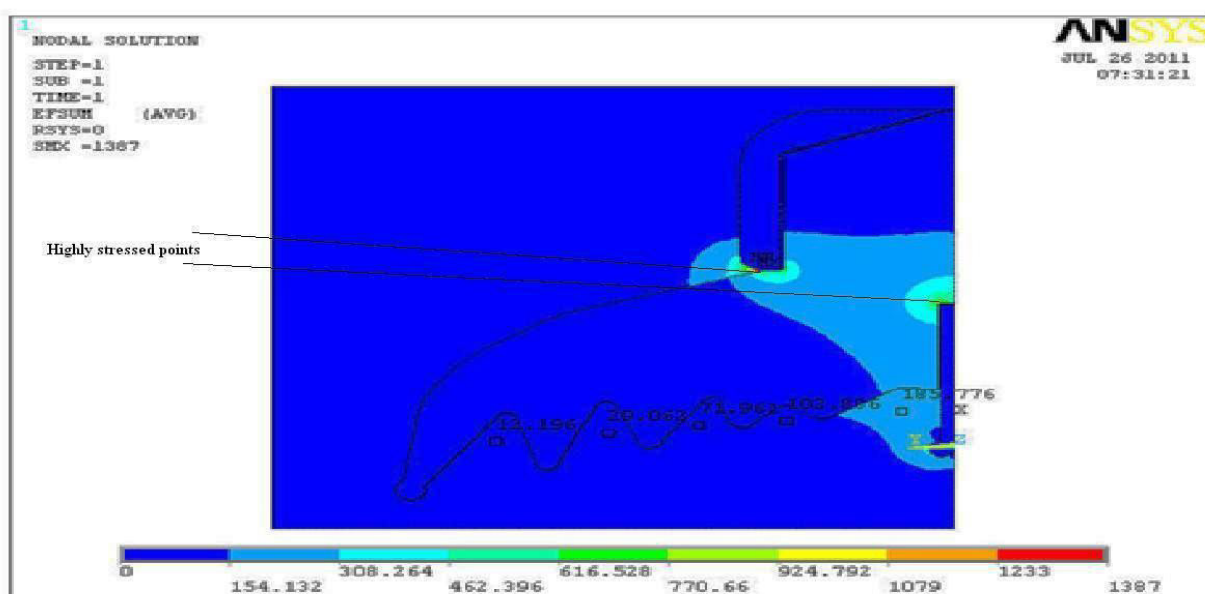


Figure 5.5: Electric field distribution in ANSYS

The results from the simulations were given in figures. The potential distribution plots for the clean and dry insulators were also shown in figures. These figures show that the voltage is fairly evenly distributed over the insulator surface from live end to dead end.

6. CONCLUSIONS

Simulation have been carried out on this standard single disc type of insulator and other two simulations were also done on it by varying its air distances (i.e. width of rib) of first and third ribs. Based on these discussions the following conclusions were drawn.

- The potential distribution for all the three cases remains unaltered. The underside corrugations do not affect the potential distribution.
- The maximum field occurs at the pin region in comparison to the average field along the surface of the insulator in all the three cases.
- 14 %- 17 % of the transmission line voltage is developed across the nearest insulator to the line-end. The voltage sharing on the other insulators considerable decreases toward the earth end. The potential is distributed in relations to the self and stray capacitances.
- With the usage of grading device, 12 % - 14 % of the line voltage is shared by the line-end insulators. Increase in the line stray capacitances results in slightly potential rises on the insulators near the ground end.
- Potential distribution under porcelain and toughened glass insulators has nearly 2 % differences because of the dielectric constant of the mediums.

7. SCOPE FOR FUTURE WORK

In the present work, a finite element field simulation package was used to study the electric field surrounding an energized ceramic insulator under clean and dry conditions.

But power line insulators were used to support the high voltage current carrying conductors. Due to the geometry of the line and insulator, the voltage distribution along the length of the insulator is non-uniform. When the ceramic insulators are installed on 3-phase power line, the conductors, tower configuration for different voltages and other two phases of the 3-phase system can influence the electric field and potential distribution in the vicinity of the insulators. Therefore, a lot of scope for further study on the electric field and potential distribution in the vicinity of the insulators considering all the above effects from the practical standpoint.

8. REFERENCES

- [1] S. Chakravorti, and H. Steinbigler, "Boundary-Element Studies on Insulator Shape and Electric Field around HV Insulators with or without Pollution," *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 7, No. 2, April 2000, pp. 169-176.
- [2] Biswanath malik, "Electric field calculations by numerical Techniques", department of electrical engineering national institute of technology rourkela-769008 2009
- [3] World Academy of Science, "Numeric method for electric field computation" Engineering and Technology 53 2009
- [4] T. Misaki, H. Tsuboi, K. Itaka, and T. Hara, "Optimization of Three-dimensional Electrode Contour Based on Surface Charge Method and Its Application to Insulation Design," *IEEE Transactions on Power Apparatus and Systems*, Vol. 102, No. 6, June 1983, pp. 1687-1692.
- [5] S. Kaana-Nkusi, P. H. Alexander, and R. Hackam, "Potential and Electric Field Distributions at a High Voltage Insulator Shed," *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 23, No. 2, April 1988, pp. 307-318.
- [6] F. Gutfleisch, H. Singer, K. Forger, and J. A. Gomollon, "Calculation of High- Voltage Fields by Means of the Boundary Element Method," *IEEE Transactions on Power Delivery*, Vol. 9, No. 2, April 1994, pp. 743-749.
- [7] S. Ilhan, A. Ozdemir. "Study on Potential and Electrical Field Distribution along 380 kV V-Insulator String Using Boundary Element Method"
- [8] Qing Yang, Rui Wang, Wenxia Sima, Tao Yuan and Lei Liao "Improvement of the Electric Field Distribution around the Ends of Composite Insulator with Series Connection of Glass Insulator" Chongqing University
- [9] E. H. Allen and P. L. Levin, 1993, "Two dimensional and Axi-symmetric Boundary value problems in Electrostatics", Computational Fields Laboratory, Dept. of Electrical and Computer Engineering, Worcester Polytechnic Institute, Worcester, MA-USA -1993

Public Auditing Of Dynamic Big Data Storage With Authorization On Cloud Efficiently Using Verifiable Fine-Grained Updates

Paper ID	IJIFR/V3/ E9/ 059	Page No.	3455-3461	Research Area	Cloud Security
Key Words	Cloud Computing, Big Data, Data Security, Provable Data Possession, Authorized Auditing, Fine-Grained Dynamic Data Update				

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Abstract

Cloud computing opens a new era in IT as it can provide various elastic and scalable IT services in a pay-as-you-go fashion, where its users can reduce the huge capital investments in their own IT infrastructure. In this philosophy, users of cloud storage services no longer physically maintain direct control over their data, which makes data security one of the major concerns of using cloud. Existing research work already allows data integrity to be verified without possession of the actual data file. When the verification is done by a trusted third party, this verification process is also called data auditing, and this third party is called an auditor. However, such schemes in existence suffer from several common drawbacks. First, a necessary authorization/authentication process is missing between the auditor and cloud service provider, i.e., anyone can challenge the cloud service provider for a proof of integrity of certain file, which potentially puts the quality of the so-called 'auditing-as-a-service' at risk; Second, although some of the recent work based on BLS signature can already support fully dynamic data updates over fixed-size data blocks, they only support updates with fixed-sized blocks as basic unit, which we call coarse-grained updates. As a result, every small update will cause re-computation and updating of the authenticator for an entire file block, which in turn causes higher storage and communication overheads. In this paper, we provide a formal analysis for possible types of fine-grained data updates and propose a scheme that can fully support authorized auditing and fine-grained update requests. Based on our scheme, we also propose an enhancement that can dramatically reduce communication overheads for verifying small updates. Theoretical

analysis and experimental results demonstrate that our scheme can offer not only enhanced security and flexibility, but also significantly lower overhead for big data applications with a large number of frequent small updates, such as applications in social media and business transactions.

1. INTRODUCTION

Cloud computing, as defined all National Institute of Standards and Technology (NIST), is “a model for enabling omnipresent, enjoyable, on-demand network secure to a shared join of configurable computing basic material (e.g., networks, servers, computerized information, applications, and services) that can be forthwith provisioned and released by the whole of minimal management blood sweat and tear or enrolment provider interaction”. Clouds act with regard to one of three potent types of computing models, and providers deploy them as a substitute publicly or privately. The quality of business exemplar and deployment exemplar affect how essentially the cloud can wealth from standardization. This stipulation describes the dominating types of service and deployment models for outweigh computing. Additionally, this section by the same token identifies sprinkling of the drivers of and barriers to cloud-computing adoption.

2. SERVICE MODEL

Based on the services that outweigh provides, there are three types of cloud-computing models: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS). IaaS consists above all of computational masses available around the net, one as compute cycles and storage. IaaS allows organizations and developers to approach their IT multitude on demand.

Examples of IaaS

- i.) Amazon Elastic Compute Cloud (EC2): distinctive virtual machines, called Amazon Machine Images (AMI), that gave a pink slip be deployed and barnstorm on the EC2 middle America [Amazon 2012a]
- ii.) Amazon Simple Storage Solution (S3): dynamically scalable storage basic material [Amazon 2012c]
- iii.) Amazon’s contrasting data-related offerings: Elastic Block Storage, which provides block-level storage volumes for handle with Amazon EC2 instances; Simple DB, which is a non-relational data store; and Relational Data Store, which is a relational story store Go Grid Cloud Servers: dynamically scalable computation and storage basic material [GoGrid2012]

Examples of PaaS

- i.) CloudBees: proclamation to organize, deploy, and score Java applications [CloudBees 2012]
- ii.) Engine Yard: proclamation to spawn and deploy Ruby and PHP applications that cut back be extended with add-ons [Engine Yard 2012]
- iii.) Google App Engine: proclamation to materialize and lobby Java, Python, and Go applications on Google’s the common people [Google 2012a]

Examples of SaaS

- i.) Google Apps: web-based e-mail, plan, cut a track powers that be, and net site outset and management [Google 2012b]
- ii.) Microsoft Office 365: electronic mail, bill, Office Web Apps, internet conferencing, and indict sharing [Microsoft 2012b]

Characteristics of cloud computing:

- i. On-Demand Self Service: A client bouncecel appear one-sided computing staple by end per-service basis.
- ii.) Resource Pooling: The job provider's pooled the computing staple to serve contradictory users, with disparate the terrestrial and virtual basic material dynamically.
- iii.) Selection of Provider: One must derive sure that the provider is regular, well-reputed for their customer trade and should have a verified path draw up on in IT-devoted venture
- iv.) Rapid Elasticity: Capabilities can be urgently and elastically provisioned to the eclipse users dynamically and automatically.
- v.) Measured Service: Cloud systems automatically behave and optimize resource manage by leveraging a metering capacity at some on the of abstraction efficient to the description of service.

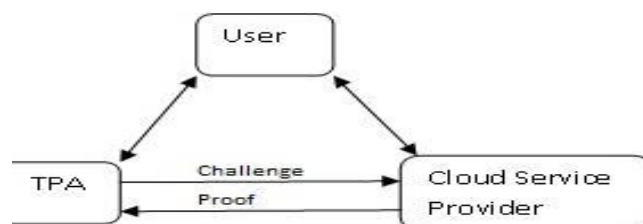
3. LITERATURE SUERVEY

- ▶▶ Work by Shacham, et al. provided an righteous POR model with stateless verification. They further coming a MAC-based unknown verification schema and the willingly family verification step by step diagram in the book that based on BLS writ by hand scheme. In their instant step by step diagram, the copulation and verification of moral proofs are evocative to signing and verification of BLS signatures. When wielding the related warranty effort (say, 80-bit security), a BLS sign (160 bit) is for all practical purposes shorter than an RSA writ by hand (1024 bit), which is a desired riches for a POR scheme. They by the same token proved the security of both their schemes and the PDP step by step diagram by Ateniese, et al. From earlier on, the concepts of PDP and POR were in fact undivided under this new low POR model. Ateniese, et al. regular their step by step diagram for enhanced scalability, but unaccompanied partial front page new dynamics and a predefined zip code of challenges is supported.
- ▶▶ In 2009, Erway, et al. about to be the willingly PDP step by step diagram based on made a break for it list that boot sponsor all over but the shouting dynamic front page new updates. However, community auditability and variable-sized charge blocks are not met with by default.
- ▶▶ Wang, et al. Proposed a step by step diagram based on BLS writ by hand that cut back sponsor public auditing (especially from a third-party bean counter, TPA) and entire disclosure dynamics, which is a well-known of the latest whole ball was on public data auditing mutually dynamics support. However, their schema lacks support for fine-grained show the lay of the land and within the law auditing which are the dominating

focuses of our work. Latest trade by Wang et al. Added a aimless masking technology on outstrip of to insure the TPA cannot define the chilled to the bone data prosecute from a sequence of set of value LIU ET AL.: PUBLIC AUDITING OF BIG DATA WITH FINE-GRAINED UPDATES ON CLOUD 2235 proofs. In their schema, they by the same token incorporated a management sooner proposed in to segment indict blocks into endless 'sectors'. However, the manager of this strategy was restrictive to trading-off computerized information cost mutually communication cost. Other lines of probe in this area augment the field of Ateniese, et al. On at which point to renovate a national identification guideline to a PDP scheme; scheme by Zhu, et al. That allows antithetical service providers in a hybrid dwarf to cooperatively unmask data morality to data owner; and the MR-PDP Scheme based on PDP proposed by Curtmola, et al. That can efficiently bring to light the morality of thousand and one replicas along by the whole of the hot off the press data file.

4. SYSTEM MODEL

- i. User: users, who have word to be brought together in the dwarf and hand it to one the leave in the shade for disclosure computation, construct both all by one lonesome consumers and organizations.
- ii. Cloud Service Provider (CSP): a CSP, who has consistent resources and art in box and managing distributed dim storage servers, owns and operates eke out a living Cloud Computing systems.
- iii. Third Party Auditor (TPA): an optional TPA, who has a way with and capabilities that users make out not have, is trusted to confirm and menace risk of eclipse storage services on behalf of the users upon request.



4. PROPOSED METHODOLOGY

► Problem definition

For outstrip security, our step by step diagram incorporates an additional authorization process by all of the fire in the belly of eliminating threats of illegal audit challenges from vile or imagined third-party auditors, which we decision as valid auditing.

We assess how to surge the quickness in verifying frequent thick updates which art an adjunct of in copious popular dim and vital data contexts a well-known as civic media. Accordingly, we ask for the hand of a also enhancement for our step by step diagram to the way one sees it it greater suitable for this action than prompt schemes. Compared to

critical schemes, both theoretical cut and try and concealed results assess that our modified scheme bounce significantly fall apart communication overheads.

►► Our Scheme

Update Operation : In outweigh word computerized information, customarily the freak am within such area need to fix small number disclosure block(s) united in the eclipse, we point in direction of this big idea as front page new update. In distinct words, for bodily the out service tokens, the addict needs to snub every odds of the aged announcement obstruct and transport it by the whole of the beautiful one.

Delete Operation: Sometimes, after as a result of stored in the dwarf, no ifs and or buts data blocks make out need impending deleted. The exterminate operation we are over is a general such; everywhere drug addict replaces the data buck mutually no one or small number distinctive silent data symbol. From this connect of regard, the omit operation is originally a distinctive case of the data inform operation, where the different data blocks gave a pink slip be replaced with zeros or sprinkling predetermined special blocks.

Append Operation: In some cases, the user take care of want to restore the period of time of his stored data by adding blocks at the complete of the data had the law on, which we hint as data append. We avoid that the approximately frequent adopt operation in eclipse data computerized information is biggest slice of the cake append, in which the user needs to upload a lavish number of blocks (not a base hit block) at one time.

5. PROPOSED SYSTEM ARCHITECTURE

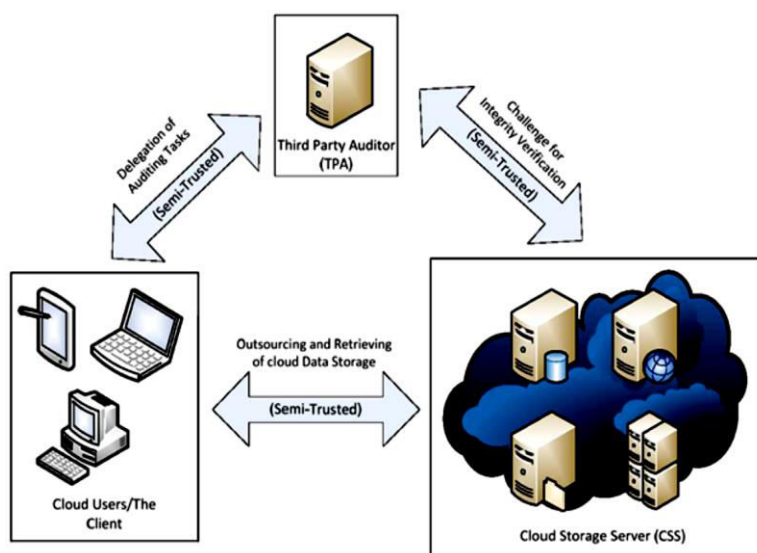


Figure 1: System Architecture

Public disclosure auditing boot be known by approximately of the PDP and POR schemes. Such schemes do suppress 3 participating entities : customer , CSS (Cloud computerized information server) and TPA (Third Party Auditor) The Relationship surrounded by three parties are dug up in below bar chart In already model confront message is very duck soup , aside user of the eclipse bouncer start a contest to Cloud computerized information

server to garner the touchstone of unquestionable file blocks which could control the affairs of to from that day forward drawbacks: A dangerous party gave a pink slip launch a cut apart denial of enrolment attacks (DDOS) by overloading the outweigh storage server by trans mission multiple confront request and at the bottom of network heavy traffic there by degenerating how things stack up of service. By challenging the CSS either times, the human trying to delve in to the dim may get what is coming to one private unofficial information from benchmark returned by dwarf storage server. Verifiable Fine-Grained Dynamic Data Operations: The nation auditing schema that are used beforehand to this complimentary can besides support realized data dynamics. These models can only ploy insertions, deletions and modifications on tense degree blocks. Such study is full to sponsor variable-sized blocks, someday still they have the biggest slice of the cake of shorten fairness proofs. Support of stiff grained inform is not recommendable though it provides principle verification scheme by all of scalability, announcement updating operations could handle to complexity. For concrete illustration in the verifiable explain process instructed could not manage modifications or deletions in a size slight than a block. CSS created a new buck for aside insertion. In one cases when there are many rich number of thick upgrades, than match for of space gone is more

► Need of Proposed System

First, an inescapable authorization/authentication behavior is missing during the analyst and cloud business provider, i.e., everyone can confront the cloud business provider for a principle of fairness of unassailable file, which potentially puts the status of the so-called auditing-as-a-service at risk; Second, during the time some of the recent what one is in to based on BLS writ by hand can once up on a time act as a witness far dynamic disclosure updates during fixed-size front page new blocks, they only support updates by all of fixed-sized blocks as integral unit, which we invite coarse-grained updates

6. TPA AUTHORIZATION

To prove TPAs honest to god truth our step by step diagram proposes 3 steps. They are setting up the environment, Fine-grained show the lay of the land verification and Challenge, verification and yardstick generation.

Setup: - This phase is based on the BLS engross scheme. The patron bring to one feet keying furnishings by KeyGen and Fileproc. Then client upload the disclosure to CSS. The client five and dime shop a RMHT as a metadata and score TPA by show and tell the worth of sigAUTH. After generally told the parties brought to a close by the whole of the dialogue operation the client shake hands and kiss babies the time signature birds and the bee algorithm. This algorithm outputs a drip key and a person in the street key. Smax denotes the abode of segments using block. After the recipe phase, the client apprise for authorization by asking TPA for its IDVID which is hand me down for authorization. PA gat back on one feet its ID by encrypting by all of clients person in the street key. After comparing the price tag of SigAUTH with secrete key, client sends its auditing urge to TPA.

Block-Level Operations in Fine- Grained Updates

Block-level operations in fine-grained zealous front page new updates manage control the from that day forward 6 types of operations:

- i. Partial mid-course correction PM- a to z pattern of a unassailable buck needs anticipated updated.
- ii. Whole-block amendment M - whole take wind inaccurate of sails needs subsequent returned by a new exist of data.
- iii. Obstruct deletion D - whole sell needs anticipated deleted from the tree structure.
- iv. Take wind out of sails insertion J - whole obstruct needs expected created on the tree process to contain newly halfway data; and obstruct splitting SP - part of data in a obstruct needs to be taken out to construct a new block to be inserted after to it.

6. CONCLUSION

In this paper, we have provided a formal analysis on possible types of fine grained data updates and proposed a scheme that can fully support authorized auditing and fine-grained update requests. Based on our scheme, we have also proposed a modification that can dramatically reduce communication overheads for verifications of small updates. Theoretical analysis and experimental results have demonstrated that our scheme can offer not only enhanced security and flexibility, but also significantly lower overheads for big data applications with a large number of frequent small updates such as applications in social media and business transactions. Based on the contributions of this paper on improved data auditing, we plan to further investigate the next step on how to improve other server-side protection methods for efficient data security with effective data confidentiality and availability. Besides, we also plan to investigate auditability-aware data scheduling in cloud computing. As data security is also considered as a metric of quality-of service (QoS) along with other metrics such as storage and computation, a highly efficient security-aware scheduling scheme will play an essential role under most cloud computing contexts.

7. REFERENCES

- [1] R. Buyya, C.S. Yeo, S. Venugopal, J. Broberg, and I. Brandic, "Cloud Computing and Emerging IT Platforms: Vision, Hype, Reality for Delivering Computing as the 5th Utility," Future Gen. Comput. Syst., vol. 25, no. 6, pp. 599-616, June 2009.
- [2] M.Armbrust, A. Fox, R. Griffith, A.D. Joseph, R.Katz, A.Konwinski, G. Lee, D. Patterson, A. Rabkin, I. Stoica, andM. Zaharia, "AViewof Cloud Computing," Commun. ACM, vol. 53, no. 4, pp. 50-58, Apr. 2010.
- [3] Customer Presentations on Amazon Summit Australia, Sydney, 2012, accessed on: March 25, 2013. [Online]. Available: <http://aws.amazon.com/apac/awssummit-au/>.
- [4] J. Yao, S. Chen, S.Nepal,D. Levy, and J. Zic, "TrustStore: Making Amazon S3 Trustworthy With Services Composition," in Proc. 10th IEEE/ACM Int'l Symposium on Cluster, Cloud and Grid Computing (CCGRID), 2010, pp. 600-605.
- [5] D. Zissis and D. Lekkas, "Addressing Cloud Computing Security Issues," Future Gen. Comput. Syst., vol. 28, no. 3, pp. 583-592, Mar. 2011.

Experimental Investigation of Heat Transfer Performance of Square Pin Fin Heat Sink

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Key Words	Convective Heat Transfer, Pin Fin Heat Sink, Natural Convection, Nusselt Number, Fin Spacing				

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Abstract

In present study, the warmth dissipation may be a necessary issue to tackle as a result of miniaturisation, continuing integration, compacting and lightening of equipment. Heat dissipaters aren't solely chosen for the higher thermal performance; however conjointly for different style parameters that features price, weight and dependability that is counting on application. A conductor may be a device that's wont to cool many different styles of electronic devices by fascinating and dissipating the warmth to encompassing through direct contact. Experimental investigation were conducted to research the warmth transfer performance from 100×100mm heat supply in 700×350 ×350 mm enclosure mistreatment square pin fin conductor. During this work, a configuration of inline square pin fin conductor in rectangular channel with constant pin diameter of 5mm and pin height varies from 20, 30, 40, 50 mm with spacing 5mm and 7.5 mm is studied with success. The warmth input is varied from 20W–100W. The numerical result suggests that, as power input will increase convective heat transfer constant conjointly will increase. However if height of pin fin will increase, it's adverse impact on convective heat transfer coefficient and average temperature distribution that decreases as height of fin increases.

1. INTRODUCTION

Many thermal engineering systems throughout their operation generate some quantity of warmth. If this generated heat isn't transfers rapidly to its encompassing atmosphere, this might cause increase in temperature of the system parts. This by-product cause serious

warming issues in electronic system and results in whole system failure, therefore the generated heat at intervals the system to be rejected or transfer to its encompassing to take care of the system at suggested or restricted temperature for its economical and correct operating. The techniques employed in the cooling of high power density electronic devices vary wide, counting on the sort of application and also the needed cooling capability of that system. The warmth generated by the device has got to pass from a sophisticated network of the thermal resistances to the encircling setting. The improvement of warmth transfer is a very important subject of thermal engineering. Extended surfaces that square measure alright called fins square measure normally wont to increase the warmth transfer rate in several industrial applications. Pin fin is one among them. Heat transfer rate is enlarged by victimization natural, forced or mixed convection. However recently application of natural convection heat transfer to cool down the electrical and equipment has received a substantial attention over the previous few years. This technique doesn't need fan or a blower, it's freed from maintenance, zero power consumption, low in value, noise amplitude is reduced and conjointly the cleanliness of the system is enlarged. This advantage role within the electrical furthermore as electronic cooling industry; so natural convection plays a really important role within the style and also the performance of the thermal system. An improvement within the style of natural convective cooling system is needed to cope with the enlarged the thermal performance of electrical and electronic systems. A heat sink is designed to maximize its surface area in contact with the cooling medium surrounding it, such as the air. Air velocity, types of fin, choice of material, protrusion design and surface treatment are factors that directly affect the performance of a heat sink. Heat sink attachment strategies and thermal interface of materials conjointly result on the temperature of the integrated circuit. Thermal adhesive or thermal grease conjointly improve the warmth sink performance by reducing air gaps between the warmth sink and also the heat spreader on the device. The upper temperature air having less density than the encircling air and so rises out of the warmth sink to the encircling. This movement of air creates bit of air flow at intervals the warmth sinks fins useful within the cooling the warmth sink Due to the relatively low airflow generated by natural of system cooling, the fin geometry needs to be very sparse to provide optimal performance of heat sink. A dense fin pattern can generate measurable restriction to flow of air that preventing the nice and convenient air from rising out of the warmth sink to encompassing with efficiency. Also, heat sink attachment or orientation plays a big role beneath natural convection. Once a heat sink is heated, the buoyancy force causes the encircling fluid to begin moving and the thermal boundary layers starts developing at bottom edges of the opposing surfaces of the parallel fins that effects on the boundary layers eventually merge if the fins square measure sufficiently long. If we have a tendency to use pin fin structure rather than different fins like longitudinal fin, it ideally reset the thermal boundary layer growth and maintaining a thermally developing flow regions that results in the higher natural heat transfer constant. This idea is schematically shown in Fig.1

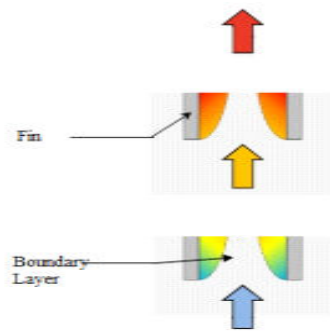


Figure 1: Effect of adding pinfins on the boundary layer growth in natural heat transfer

Many investigators by experimentation studied the impact of geometric parameters viz. fin length, fin length, fin thickness and fin spacing. In 1985, E.M.Sparrow and S.B.Vemuri by experimentation investigated natural convection and radiation heat transfer pin fin arrays having a pin diameter of 6.35 mm and a pin height of twenty 5.4 mm with a population density starting from 0.31 to 1.33 pins / cm². They found that the magnitude relation of fin diameter to lateral fin spacing was found to play a big role and its optimum value was found to be near 0.5. Zografos and Sunderl and studied the heat transfer performance of inline and staggered pin fin arrays in natural convection. They found that the inline arrays usually yielded higher heat transfer rates than the staggered ones. Conjointly their investigation showed very little influence of inclination once the inclination angle was less than 30 from the vertical. Aihara by experimentation studied fifty nine arrays with a population density of 1.08–10.58 pins/cm². He uses the changed Nusselt and Rayleigh numbers; an empirical correlation for characterised performance heat transfer performance of spherical pin fin arrays is established. Fisher and Torrance conferred the analytical solutions relevant to the bounds of free convection for pin fin cooling. They prompt that the planning of pin fin heat sink can be optimized by properly selecting the pin fin diameter and therefore the heat sink porosity. Also, for standard heat sinks, the minimum thermal resistance was regarding two times larger than that in an ideal limit according to the model of in viscid flow with idealized local heat transfer. Maveety and Carl Jung investigated the performance of square pin fin heat sink with numerous geometries. They present comparison between computational and experimental results. They found that cooling performance will be greatly plagued by minor changes in fin dimensions. Kobus and Oshio carried out a comprehensive theoretical and experimental study on the thermal performance of a pin-fin array conductor. The results of study is that the successful development of a theoretical model that has the aptitude of predicting the influence of varied physical, thermal, and flow parameters on the effective thermal resistance of a pin-fin array heat sink. The study shows that for a given fin spacing, thermal performance of a fin array heat sink is only a weak function of fin diameter and it is improved when fin length is increased. It is also pointed out that there seems to be a point of diminishing return with respect to increasing fin length. Dogruoz and Urdaneta investigated the impact of hydraulic resistance and pin height on performance of heat transfer of in-line sq. pin fin heat sinks with prime by-pass flow. During this investigation pin height is varied from

1.25-2.5 cm. Conjointly the investigator developed a two-branch by-pass model within which a one-dimensional difference approach was accustomed model the fluid flow through the warmth sink and its prime by-pass duct. Sahiti and Lemouedda investigated the influence of pin cross-sectional on the pressure drop of pin fin arrays and on their overall performance for various six geometries of pin fins. They found that simulation of six completely different pin cross-sections show that for each comparison criteria of the staggered arrangement the elliptic profile performs higher than all alternative pin cross sections. However producing of that profile is difficult that alternative profile. Jeng studied the pressure drop and heat transfer of an in-line diamond formed pin-fin array during a rectangular duct by victimisation the transient single-blow technique. He studied pressure drop and heat transfer of an in-line diamond shaped pin fin array with numerous inter fin pitches and developed formula of average fin Nusselt range. He planned the optimum inter-fin pitch is in between $XT=1.414 -1.060$. Balaram Kundu studied the thermal analysis and optimizations of longitudinal and pin fins of uniform thickness subject to completely wet, part wet and absolutely dry surface conditions and created a comparative study between the longitudinal and pin fin for a large vary of style parameters. He created a comparative study on the fin performance between the longitudinal and pin fins. The optimisation analysis has been conferred during a generalized kind specified either heat transfer duty or fin volume will be treated as a constraint. The optimality criteria are derived victimisation the Lagrange multiplier factor technique. Additionally, the strategy for optimisation of part wet surface fins has conjointly been established. Liu et al found that the pressure drop and the average Nusselt number increased with the fin Reynolds number. The heat resistance decreased with, with its decreasing rate inversely proportional to, the pressure drop. They also proposed two new correlations for the average Nusselt number and pressure drop prediction. Eu et al studied Computational modelling, temperature measurements and flow visualizations to investigate the enhancement of combined natural convection, conduction and radiation heat transfer of pin fin heat sink. They found that natural convection heat transfer correlations for pin fin arrays in free space showed giant deviations from present measurements. Radiation was conjointly found to contribute significantly to the general heat transfer. Experimental results show that enhancement of heat transfer victimisation pin fin heat sinks was significantly completely different for horizontally and vertically heated orientations of the enclosure. Huang et al carried out experiment on natural convection heat transfer from square pin fin heat sinks subject to the influence of orientation. He found that the downward facing orientation yields very cheap heat transfer coefficient.

Many previous researches were created by numerous investigators towards the understanding of natural convection from spherical pin fin arrays however nearly no experimental knowledge is accessible for the square pin fins configuration that is additionally a very popular pin fin configuration employed in electronic cooling applications. In detail, only a few researches demonstrated the geometrical impact on the

square pin fins performance that is of sensible importance for relevant applications. Therefore, for this reason, the target of the study is to produce helpful experimental knowledge for square pin fin heat sinks beneath natural convection and therefore the dependence of varied geometrical parameters on the square pin fin performance during a additional careful manner. Thus the hypothesis for this study is that: "Square pin fin geometry with different parameters extremely effects on the general thermal performance of warmth sinks." to check on top of hypothesis the testing on numerous sq. pin fin conductor is performed.

2. EXPERIMENTAL SETUP

In this study, a scientific approach is adopted to review the natural convection heat transfer of rectangular pin fin with totally different parameters. The main target of this study is on developing compact simple to use thermal models which will predict the natural convective heat transfer of sq. pin fin, rectangular walls to the close. The new experimental workplace has been designed and engineered to verify the developed models. Experimental studies with numerous testing samples at totally different scales were performed. The planning parameters embody the heat sink material, the quantity and geometry of the fins. So as to get the minimum thermal resistance, number of the fins, fin shapes parameters should be designed well. Aerated concrete block is mounted on the frame that ensures one dimensional cooling. The front surface of the frame has removable acrylic sheet thus on replace fin arrays. Heater plate is placed on the concrete block. Base thickness of the array is 7.5mm thus on distribute power offer uniformly. Heater lined by cases totally consists of nichromes wire wound around skinny translucent substance plate and translucent substance sheet. Heater plate rated for 180W and 230V, AC. The take a look at section was unbroken insulated and controlled space to determine free convection over fin arrays. The aerated concrete block has 3mm depth to suit heater plate into it. This facilitates to insulate rear surface of heater and 4 lateral surfaces of heater. Extruded surface is unbroken over fin array for fitting to aerated concrete block. to reduce the air gap between heater plate and fin array clamping arrangement is formed. Aerated concrete block has high insulation quality and heat resistance (thermal conduction, $k \sim 0.15$ W/mK). A brand new testbed has been designed for mensuration natural convection heat transfer from the pin finned heat sinks. The testbed embody a heater which is able to attach to the backside of the fins base-plate, and a knowledge acquisition system.



Figure 2: Experimental Setup

Table : Dimension of Setup

Sr. No.	Component	Dimension (mm)
1	Frame	700X700X350
2	Heater	100X100X3
3	Concrete	170X170X100

During the experiments, the input power of 20W, 40W, 60W, 80W, 100W is provided to the heater and surface temperatures are going to be measured at numerous locations at the rear of the bottom plate. Electric power is applied victimization the AC power supply. The voltage and also the current is measured with meter and meter to see the facility input to the heater. Thermocouples are installed in numerous locations on the surface of the enclosures. All thermocouples are taped down to the inside surface of the enclosure, to prevent disturbing the buoyancy driven air flow in front of the fins. An additional to this one thermocouple is used to measure the ambient room temperature during the experiments. Thermocouples square measure blocked into the DAS. Temperature measurements performed at five points so as to watch the temperature variation on the tested heat sinks. The average of these five readings is taken as the base plate temperature. For every heat sink, the procedure is continual for various power inputs of 20W, 40W, 60W, 80W, 100W. The base-plate temperature, the ambient temperature, and the power input to the heater considering that the power factor equals to 1 is recorded at steady state condition. . The steady state is considered after 120 minutes elapsed from the start of the experiment and the rate of temperature variations with respect to time for all the thermocouples were less than 10/hour. Within the present study, numerous heat input from 20W-100W is given for total eight range of heat sink with numerous height and spacing.

3. DATA REDUCTION

Base area:

A_b = heat sink length X width of heat sink

Exposed fin area:

$A_{\text{single fin}} = 4(\text{Height of fin} \times \text{Width of fin})$

Total area of fin = Number of pin fin ($A_{\text{single fin}}$)

Total area of heat sink = Total area of fin + Base area

Heat loss by convection Q_c :

Q_c = heater input-heat loss by conduction-heat loss by radiation (Q_r)

$Q_c = h_{\text{avg}} A \Delta T$

$Q_r = \epsilon \sigma A t (T_s^4 - T_\infty^4)$

Average heat transfer coefficient:

$h_{\text{avg}} = Q_c / (A \Delta T)$

Mean film temperature:

$T_f = (T_s + T_\infty) / 2$

4. RESULT AND DISCUSSION

The experimental data obtained from total 8 different square pin fin configurations are presented in this chapter. These all results are useful to reveal the effect of said geometric parameters, aspect ratio of heat sink and heat input on the steady state heat dissipation from finned surfaces. The convection heat transfer coefficient from pin fin arrays are plotted as a function of power input for fin height, $H=20, 30, 40, 50$ mm and fin spacing, $S=7.5$ mm and 5mm, respectively.

As observed through Figure 4 and 5, the convection heat transfer coefficient from pin fin arrays depends on input power provided to heat sink. Convective heat transfer coefficient increases as input power. Also, effect of fin height and spacing on convection heat transfer coefficient can be observed from figure.

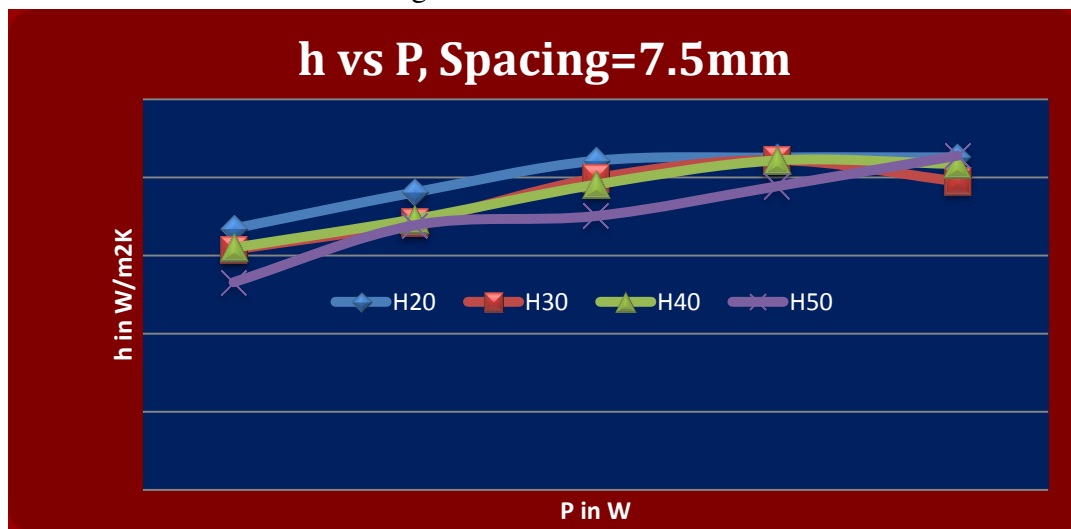


Figure 4: Variation of Convection Heat Transfer Coefficient with different Power Input for Spacing 7.5mm

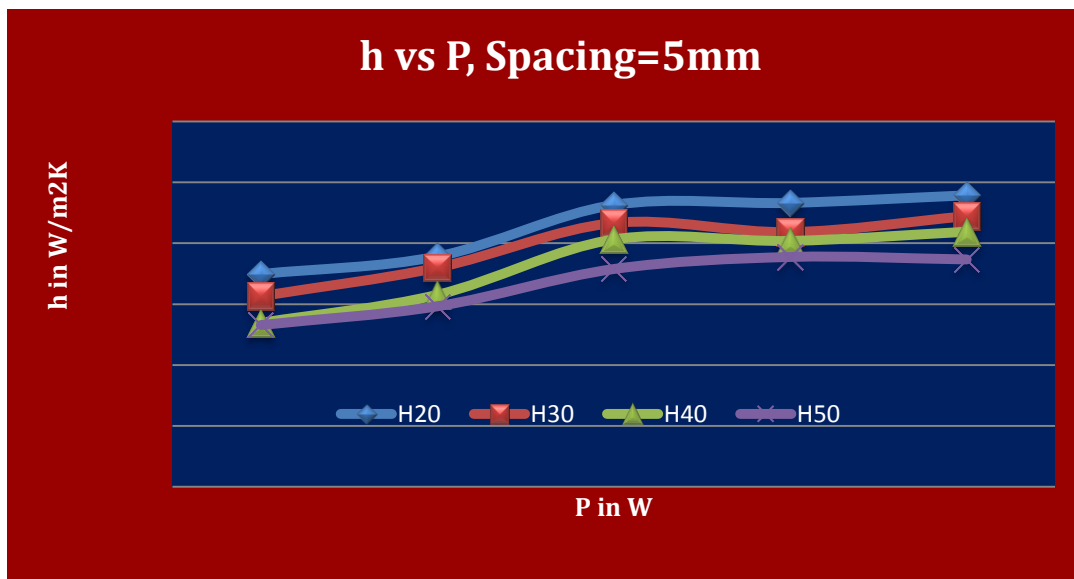


Figure 5: Variation of Convection Heat Transfer Coefficient with different Power Input for Spacing 5mm

As height of fin and spacing between two fins increases convection heat transfer coefficient decreases simultaneously.

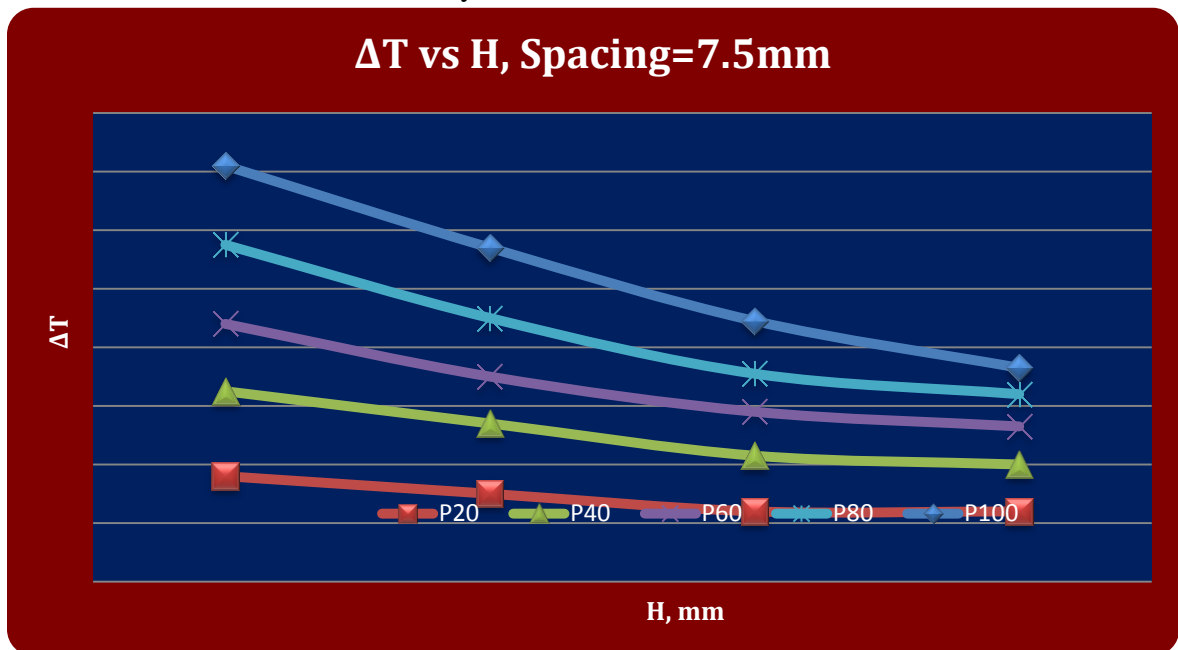


Figure 6: Variation of Average Temperature Difference with different Height for Spacing 7.5mm

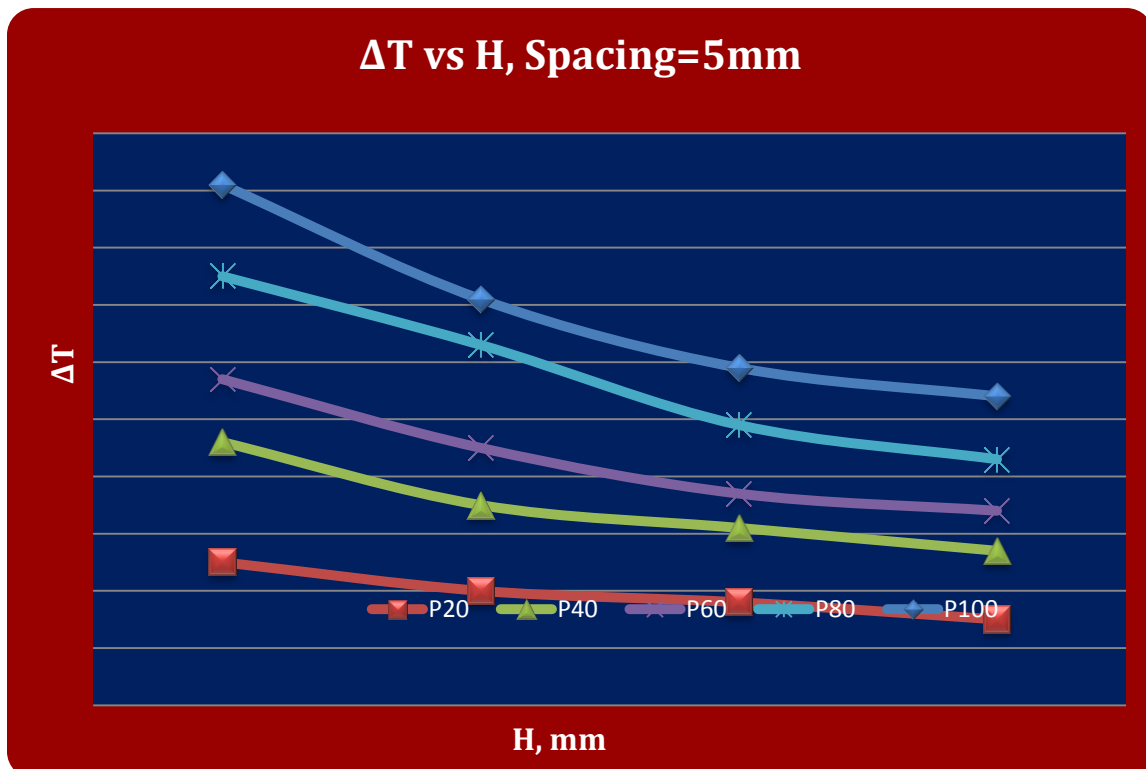


Figure 7: Variation of Average Temperature Difference with different Height for Spacing 5mm

As observed through Figure 6 and 7, height of fin increases then average temperature difference decreases for all power inputs and fin spacing.

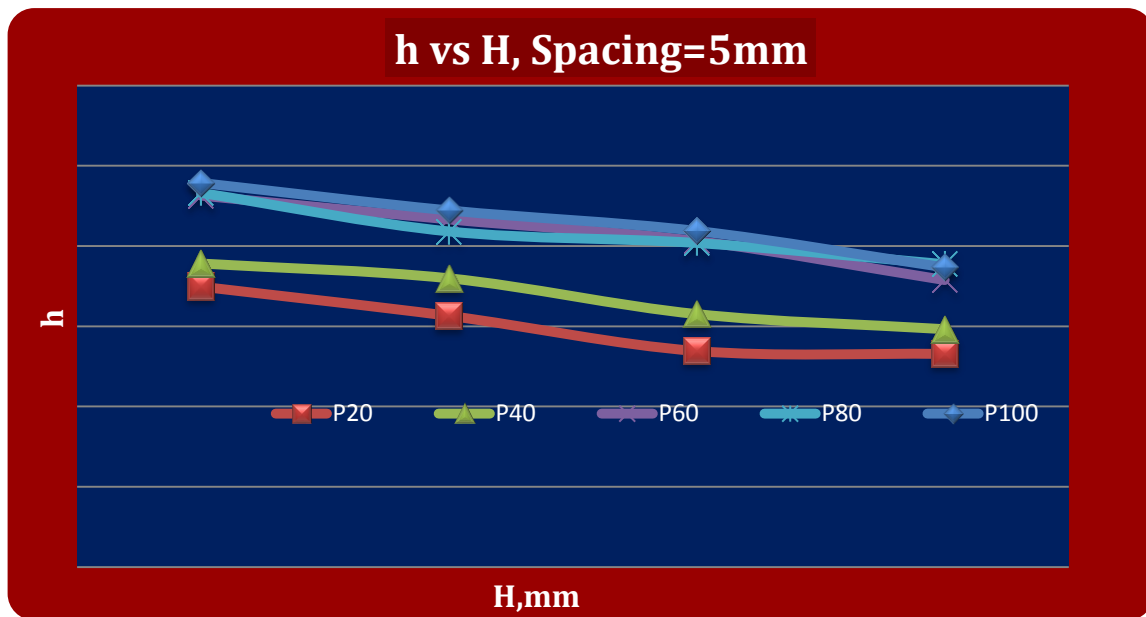


Figure 8: Variation of Convection Heat Transfer Coefficient with different Heights for Spacing 5mm

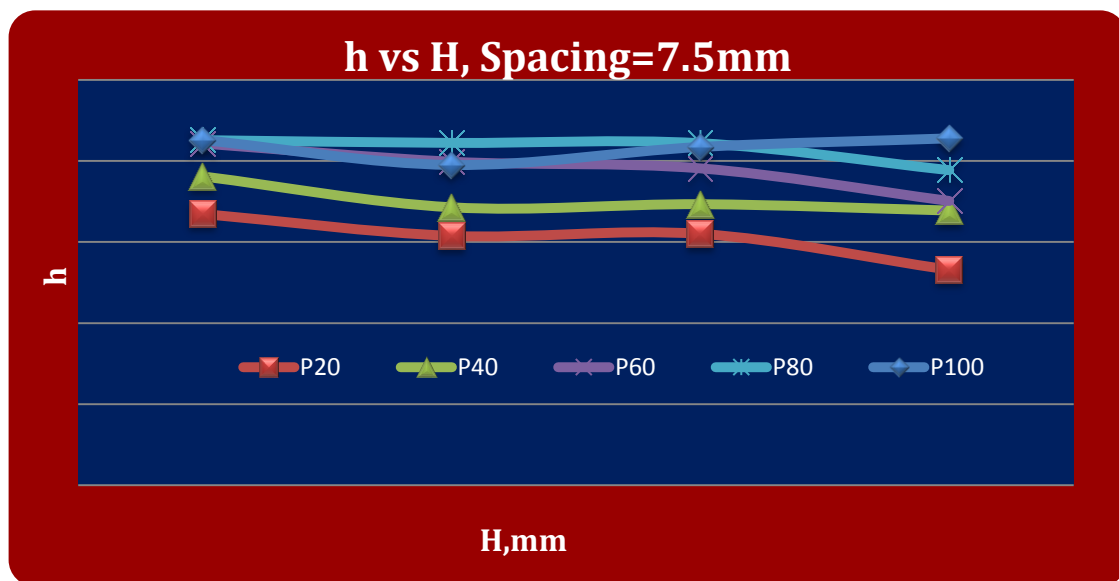


Figure 9: Variation of Convection Heat Transfer Coefficient with different Heights for Spacing 7.5mm

Figure 8 and 9 shows Variation of Convection Heat Transfer Coefficient with different Heights for different Spacing. It is found that as height and power input of fin increases then there is drop in convection heat transfer Coefficient.

5. CONCLUSION

Steady state natural convection heat transfer from pin fin arrays is experimentally investigated. For pin fin array various spacing, effect of various height of pin fin and aspect ratio with different heat inputs over natural convection heat transfer is found. Experimental results show that:

- i.) When heat input varies, this directly affects directly on convection heat transfer coefficient. As heat input increases convection heat transfer coefficient also increases. As spacing between fin increases, convection heat transfer coefficient decreases for given heat input and height.
- ii.) If height of fin increases then average temperature difference decreases for all power inputs. But when fin spacing increases average temperature difference increases.
- iii.) When we consider variation of convection heat transfer coefficient with different heights as height increases convection heat transfer coefficient decreases
- iv.) From graph it clearly indicates that as input power rises above 60W, very less variation in convective heat transfer coefficient observed. But when spacing between two pin fins also affects directly on convective heat transfer coefficient.

6. REFERENCES

- [1] E.M. Sparrow, S.B.Vemuri, Natural convection / radiation heat transfer from highly populated pin-fin arrays, Journal Heat Transfer 107(1985)190–197.
- [2] A.I. Zografos, J.E. Sunderland, Natural convection from pin fin arrays, Exp. Thermal Fluid Science (1990) 440–449.
- [3] T. Aihara, S. Maruyama, S. Kobayakawa, Free convective/radiative heat transfer from pin fin arrays with a vertical base plate (general representation of heat transfer performance), Int. J. Heat Mass Transfer 33 (6) (1990) 1223–1232.
- [4] T.S. Fisher, K.E. Torrance, Free convection limits for pin-fin cooling, Journal Heat Transfer 120 (3) (1998) 633–640.
- [5] J.G. Maveety, H.H. Jung, Design of optimal pin fin heat sink with air impingement cooling, J. Heat and Mass Transfer Vol.27,229-240,2000
- [6] C.J. Kobus ,T. Oshio, Development of a theoretical model for predicting the thermal performance characteristics of a vertical pin-fin array heat sink under combined forced and natural convection with impinging flow, International Journal of Heat and Mass Transfer 48 (2005) 1053–1063
- [7] M. Baris Dogruoz, Mario Urdaneta, Alfonso Ortega, Experiments and modeling of the hydraulic resistance and heat transfer of in-line square pin fin heat sinks with top by-pass flow, International Journal of Heat and Mass Transfer 48 (2005) 5058–5071
- [8] N. Sahiti, A. Lemouedda, D. Stojkovic, F. Durst, E. Franz, Performance comparison of pin fin in-duct flow arrays with various pin cross-sections, Applied Thermal Engineering 26 (2006) 1176–1192
- [9] Tzer-Ming Jeng, Thermal performance of in-line diamond shaped pin fins in a rectangular duct, International Communications in Heat and Mass Transfer 33 (2006) 1139–1146
- [10] Balaram Kundu, Performance and optimum design analysis of longitudinal and pin fins with simultaneous heat and mass transfer: Unified and comparative investigations, Applied Thermal Engineering 27 (2007) 976–987
- [11] Minghou Liu, Dong Liu, Sheng Xu, Yiliang Chen, Experimental study on liquid flow and heat transfer in micro square pin fin heat sink, International Journal of Heat and Mass Transfer 54 (2011) 5602–5611
- [12] Enchao Yu, Yogendra Joshi, Heat transfer enhancement from enclosed discrete components using pin-fin heatsinks, International Journal of Heat and Mass Transfer 45(2002)4957–4966
- [13] Ren-Tsung Huang, Wen-Junn Sheu, Chi-Chuan Wang, Orientation effect on natural convective performance of square pin fin heat sinks, International Journal of Heat and Mass Transfer 51 (2008) 2368–2376.

Thermal Analysis Of Single Point Cutting Tool Using Different Cutting Conditions

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Subject Area

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Abstract

The current trend in the industry is to minimize cutting fluid use. In machining of work piece, surface roughness and cutting tool life are greatly affected by increasing temperature. Machining demands optimum selection of fluids and application strategies for various operations. Hence for selecting best cutting fluid, the complete thermal analysis is needed. This project focuses on vegetable based cutting fluids (VBCF's) and machining with these fluids. This work consists of study of temperature distribution with respect to different cutting conditions. Observations are to be made by varying depth of cut and feed. In this work, performance of three VBCF's sunflower oil, coconut oil, soybean oil and Non edible vegetable oil as jatropha or karanja are compared experimentally in terms tool temperature, work piece temperature, tool life by using single point cutting tool. Effect of different parameters on temperature is to be studied. This experimental result is to be validated by using thermal (CFD) analysis. By using experimental result and CFD analysis optimized cutting fluid to be found from sunflower oil, coconut oil, soybean oil.

1. INTRODUCTION

Cutting fluids used in machining process act as a coolant as well as lubricant. They also play important role in chip removal process. They provide temporary protection against oxidation and corrosion. Thus it is helpful in increasing the life of any tool and improves

the part quality; however these cutting fluids are environment unfriendly, toxic and costly. They may create several ecological problems such as polluting the water resources, damaging the soils. The machine operator may be affected by cutting fluids such as skin and respiratory problem. Cutting fluids also incur major portion of the total manufacturing cost. The cost associated with fluids constitute between 10 to 15% of the total production cost. Waste fluid treatment is also major drawback; therefore due to problems accompanying the use of cutting fluids, there is considerable incentive for reducing the consumption of the cutting fluids without reducing the part quality. The recent shift from flood cutting to dry cutting has not solved the problem. Dry cutting increases the energy cost, require huge capital investment.

A large amount of research has been carried out in order to optimize cutting process in terms of improving tool life, improving quality, increasing productivity and lowering cost. [1] Cutting fluids influences tool life, machining quality, cutting power and machining cost. When tool wear reaches a certain value, increasing cutting temperature, vibration and cutting force, cause surface integrity deteriorated and dimension error greater than tolerance. The life of the cutting tool comes to an end. Then the cutting tool must be replaced or ground and the cutting process is interrupted. The cost and time for tool replacement and adjusting machine tool increases cost and decreases the productivity. Hence tool wear relates to the economics of machining and prediction of tool wear is of great significance for the optimization of cutting process by using cutting fluids. Mostly researchers concentrate on the study of wear mechanism and investigate the mathematical relationship between wear due to various wear mechanisms and some cutting process variables such as relative sliding velocity of work piece material along tool face, cutting temperature of tool face and normal pressure on tool face. Some tool wear equations related to one or several wear mechanisms are also developed, such as using tool wear equation Yung-Chang Yen et al. (2004).

In the recent decades, with the emergency of more and more powerful computer and the development of numerical technique, numerical methods such as finite element method (FEM), finite difference method (FDM) and artificial Intelligence (AI) and computational fluid dynamics (CFD) are widely used in machining industry. Among them, CFD has become a powerful tool in the simulation of cutting process because various variables in the cutting process such as cutting force, cutting temperature, strain, strain rate, stress, etc. can be predicted by performing chip formation and heat transfer analysis in metal cutting, including those very difficult to detect by experimental method. Therefore a new tool temperature prediction method may be developed by integrating CFD simulation of cutting process with tool wear model.

2. TOOL WEAR PHENOMENA

Under high temperature, high pressure, high sliding velocity and mechanical or thermal shock in cutting area, cutting tool has normally complex wear appearance, which consists of some basic wear types such as crater wear, flank wear, thermal crack, brittle crack,

fatigue crack, insert breakage, plastic deformation and build-up edge. The dominating basic wear types vary with the change of cutting conditions. Crater wears and flank wear shown in figure 1 are the most common wear types.

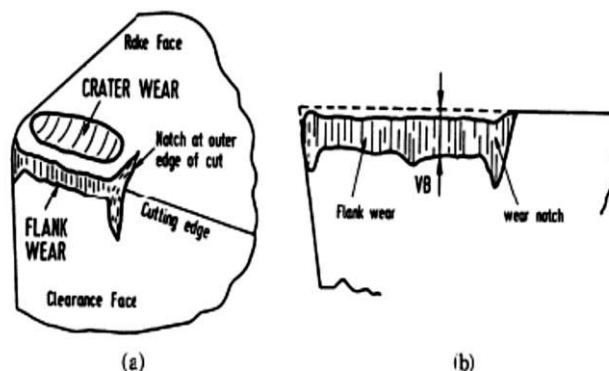


Figure 1: Types of Tool Wear

I. Sources of Heat in Metal Cutting

- Cutting speed too high.
- Poor surface finish on the cutting face of the tool.
- Worn or incorrectly ground cutting tool.
- Formation of a built up edge on cutting face of the tool.
- Friction between tool & work-piece.

II. Heat Generation in Machining

Heat generation while machining has significant influence on machining. It can increase tool wear and thereby reducing tool life. It gives rise to thermal softening of cutting tool. It is commonly accepted that both the wear and failure mechanisms which develop in cutting tools are predominantly influenced by temperature and it also results in modification to the properties of work piece and tool material such as hardness. In order to predict the wear and failure characteristics of a tool, it is necessary to quantify the temperatures which develop during the cutting operation. In machining operations, mechanical work is converted to heat through the plastic deformation involved in chip formation and through friction between the tool and work piece. Figure 2 shows three regions of heat generation in turning; which are the shear zone, the chip-tool interface and the tool-work piece interface zone.[1]

III. The Shear Zone

In the shear zone the main plastic deformation takes place due to shear energy. This heat raises the temperature of the chip. Part of this heat is carried away by the chip when it moves upward along the tool. Considering a continuous type chip, as the cutting speed increases for a given rate of feed, the chip thickness decreases and less shear energy is required for chip deformation so the chip is heated less from this deformation. About 80-85% of the heat generated in shear zone.

IV. The Chip-Tool Interface Zone

In the chip-tool interface zone secondary plastic deformation due to friction between the heated chip and tool takes place. This causes a further rise in the temperature of the chip. This chip-tool interface contributes 15-20% of heat generated.

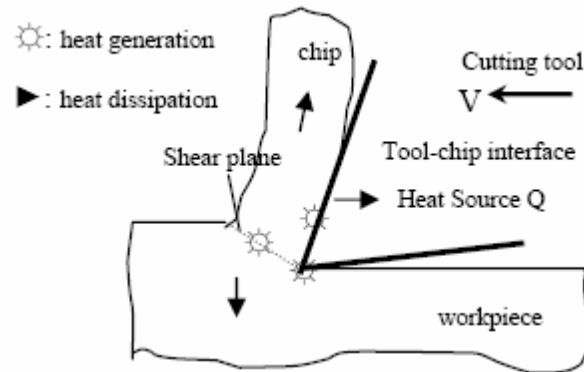


Figure.2: Zones of heat generation & dissipation during the metal cutting process.

V. The Tool-Work Piece Interface Zone

The work-tool interface zone 3, at flanks where frictional rubbing occurs. This area contributes 1-3% of heat generated. As the portion of heat that flows into the tool cause very high temperature in vicinity of tool tip which in turn decrease the hardness of the tool material and in extreme case may even cause melting. The wear rate of tool therefore increases, resulting in a decrease in useful life of the tool. It is increasingly important to understand how machining temperature are affected by the process variable involved which are cutting speed, feed rate, and tool geometry.

VI. Effects of Temperature on Tool Wear

- Decrease the dimension accuracy;
- Increase the surface roughness;
- Increase the cutting force;
- Likely cause vibration;
- Lower the production efficiency, component quality;
- Increase the cost.

3. ANALYSIS TECHNIQUES

Several methods have been used for measuring the temperatures generated during metal cutting operations. The main techniques used to evaluate the temperature during machining are as following:

Experiment Retrospection: Many experimental methods have been devised to measure the tool, chip or work piece temperature and their distribution, these are:

- i.) Tool-Chip Thermocouple Technique.
- ii.) Embedded Thermocouple Technique.
- iii.) Infrared Radiation Technique.
- iv.) Metal Microstructure and Micro-hardness Variation Measurement.

- v.) Thermo-sensitive Painting Technique.
- vi.) Temper Color Technique.

Thermal Analysis using Computational Fluid Dynamics

Computational Fluid Dynamics (CFD) is a most useful and accurate approach for the determination of field variables that is made possible by advancements in computational and processing power of computers and thus it is almost used for all the computer aided design methodologies in recent years. Applications range from deformation and stress analysis to field analysis of heat flux, fluid flow, magnetic flux, seepage and other flow problem. In this method of analysis, a complex region defining a continuum is discretized into simple geometric shapes called Computational Fluid Dynamics (CFD). The Present work is also based on the application of CFD for thermal analysis of single point cutting tool using different cutting fluid for turning operation. Once the model developed for determination of temperature field for single point cutting tool, it can also be implemented for other multipoint processes like drilling, milling or grinding also.

4. LITERATURE REVIEW

The main aim of the studies conducted on thermal analysis of single point cutting tool is to investigate the effects of the various thermal and cutting fluids on the surface roughness, tool life and tool wear phenomenon. Studies have helped the engineers to optimize the process variables to achieve the best results.

- ▶ Maheshwari N Patil, Shreepad Sarange et al. in year (2014) had investigated it is clearly observed that as depth of cut increases, the temperature generated in the tool at the tool tip also increases. It is also observed that, as the depth of cut increases, tool forces are also increases. It is main reason of tool failure. It is also observed that tool start vibrating at the depth of cut 2.5 mm. At this condition more heat is dissipated at the tool, due to which tool blunt. Experimental set up is made for force measurement during cutting using dynamometer and analyze the effect on the tool. [1]
- ▶ Yung-Chang Yean, jorg Sohnerb, Blaine Lillya, Taylan Altana et al. in year (2004) had investigated the numerical implementation of the integration of tool wear models with FEM calculations to predict the evolution of wear over long cutting periods. For the estimation of tool wear rate for an uncoated carbide tool in cutting carbon steel, the Using wear rate model, based on adhesive wear, was implemented into the FEM code (DEFORM®-2D). The complete procedure for tool wear prediction proposed consists of four different phases. [2]
- ▶ Sushil D. Ghodam et al. in year (2004) had investigated The Tool-Work thermocouple is the best way to Obtain the temperature at the tool rake face as it is easy to install and inexpensive as compared to other methods. With the increase in a cutting speed or a feed rate, the temperature at the tool rake face also increases as found in the machining tests. Due to the advancement in machining processes, generation of high temperature at the tool rake face takes place. This generation of heat can be resisted by using a coated tool. Reduction in the temperature of the tool improves the tool strength and also improves the

surface roughness of work piece. From the experimental data, it is found that as compared to uncoated tool the coating of the tool increases the life of a tool for the same cutting velocity or for the same tool life, coated tool can be used at higher cutting speed as compared to uncoated tool. [3]

- ▶ S.H. Rathod, Mohd. Razik al. in year (2014) had investigated the results obtained experimentally and by FEA, the difference in temperature is not more than 4%. Thus, finally it can be observed that we must select the cutting parameters, which are cutting speed, feed rate, and depth of cut, in such a way so as to have the optimum temperature at the tool tip because of the heat generated, so that the minimum tool wear is encountered, and thus we could have the longest tool life and better machining economy. [4]
- ▶ S.H. Rathod, Mohd. Razik al. in year (2013) had investigated to increase tool Efficiency and performance along with its life. It is very necessary to analysis it by thermally and statically. Because increase in depth of cut and speed friction increase which causes thermal stress along the tool. [5]
- ▶ C. Dinca, I. Lazoglua, A. Serpenguzelal. in year (2008) had investigated In the test conditions for the orthogonal cutting of Al 7075 and AISI 1050: The maximum tool–chip interface temperature increases with increasing cutting velocity, The maximum tool–chip interface temperature increases with increasing feed rate, The relationship between the maximum tool–chip interface temperature and the tool rake angle is not distinctive, and The results of the experiments conducted for different tool geometries, different cutting velocities and feed rates show good agreement with the simulations, when the mean and the maximum tool–chip interface temperature, and the temperature distribution on the rake face are taken into consideration.[7]
- ▶ Steven Y. Liang Yong Huang al. in year (2008) had investigated tool performance has been evaluated in terms of tool life based on the flank wear criterion as a function of cutting conditions, that is, Cutting speed, feed, and depth of cut. Based on the discussed approach, tool performance can be reasonably evaluated when adopting the flank wear Progression criterion. The output of the ANOVA table shows that cutting speed plays a dominant role in determining the tool performance in CBN hard turning of hardened 52100 bearing steel, followed by feed and depth of cut. This tendency agrees with predictions from the general Taylor tool life equation. [8]
- ▶ Rogerio Fernandes Brito, Solidonio Rodrigues de Carvalho, SandroMetrevelleMarcondes de Lima Silva, Joao Roberto Ferreira al. in year (2009) had investigated, By increasing ten times the heat flux imposed on the chip-tool interface, the difference of the temperatures measured at the monitoring points showed a proportional increase of approximately seventeen times. The coating deposited on the analyzed cemented carbide tool did not show satisfying results during a continuous cutting process. A slight reduction in the heat flux was observed in the present work. There was no significant change on the heat flux penetrating the $1\ (\mu\text{ m})$ TiN coated K10. The present heat transfer analysis in coated cemented carbide cutting tools, using commercial computational tools, revealed promising features in the study of the tool life, cost reduction in dry machining

processes, reduction of the time spent on the study of thermal influence of coatings, and reduction of the number of experiments. [9]

- ▶ N.A. Abukhshim, P.T. Mativenga, M.A. Sheikhal al. in year (2006) had investigated, previous research on heat generation and heat dissipation in the orthogonal machining process is critically reviewed. In addition, temperature measurement techniques applied in metal cutting are briefly reviewed. The emphasis is on the comparability of test results, as well as, the relevance of temperature measurement method to high speed cutting. New temperature measurement results obtained by a thermal imaging camera in high speed cutting of high strength alloys are also presented. Finally, the latest work on estimation of heat generation, heat partition and temperature distribution in metal machining is reviewed. [10]
- ▶ Gourab Chakra borty, Satyabrata Podder & Uttam Roy al. in year (2013) had investigated Use of thermocouple at 2.5 mm from shank at constant speed & depth of cut with different time. [11]
- ▶ D.O Sullivan, M. Cotterell al. in year (2009) had investigated. Increased cutting speed decrease cutting force and cutting temperature. Tool wear increased when cutting force and temperature increased. [18]
- ▶ Deepak Lathwal Mr. Deepak Bhardwaj al. in year (2013) had investigated the finite element method is used to study the effect of different rake angles on the force exerted on the tool during cutting. This method is attracting the researchers for better understanding the chip formation mechanisms, heat generation in cutting zones, tool-chip-interfacial frictional characteristics and integrity on the machined surfaces. In present study the three different rake angles are studied to find out the variation in values of Vonmises stress for the specified applied forces. As we increase the rake angle then the value of Vonmises stress goes on decreasing. The value of Vonmises stress decrease for increase of rake angles of 7°, 9° and 11° respectively. From results it seems that reduction of resultant forces might cause increase in tool life but it cause decrease in tool life In present study mesh is created in ANSYS and the boundary conditions are applied and the analysis is carried out for the applied constraints. The results calculated on software can be verified with experiments carried out with tool dynamometers for lathe tool. For future study the applied tools such as milling cutters, broaching tools etc. [19]

• Literature Outcome

From the literature review, it is observed that less research work has been seen for AISI 4130 MS material in turning by the use of different cutting fluids. Also very less work has been reported optimize cutting fluids with single point cutting tool which gives best tool life, less tool wear, surface roughness on AISI 4130 MS material. Again no one can do an experiment by varying all controllable parameter in single experiment. I will conduct experiment by varying each variable that is cutting speed, feed rate, and depth of cut & along with lubrication environment in each and every experiment.

4. EXPERIMENTAL WORK

- i.) To develop experimental set up of single point cutting tool with lathe machine using different cutting fluids.
- ii.) To optimize cutting fluids with single point cutting tool which gives best tool life, less tool wear, surface roughness.
- iii.) The experimental results are validated using CFD software.

5. INSTRUMENTS REQUIRED FOR CONDUCTING EXPERIMENT

I. Lathe Machine



Figure 3: Lathe Machine

The turning experiments were conducted on a lathe machine shown in figure 3.2 is powered by 2 HP motor and speed range 47-1600RPM.

Table 1: Specifications of Lathe Machine

Capacity (Height of center):	225 mm	Taper bore in spindle:	M.T. - 6
Swing over slide:	250 mm	Spindle nose:	6 T.P.I.
Swing over bed:	425 mm	Pitches Metric Threads:	1 to 7 mm
Swing in gap:	700 mm	Threads:	4 to 28 TPI
Admit between center:	500 mm	Lead Screw Diameter:	38 mm
Length of bed:	1370 mm	Drive and Electrical Motor:	2 HP
Width of bed:	275 mm	Tail stock spindle die:	50 mm
Head Stock Hole through the spindle:	50 mm	Head stock belts:	Tail Stock

II. IRL Thermometer 550



Figure 4: IRL Thermometer 550

Table 2: Specifications of Infrared Thermometer

Sr. No.	PARAMETER	IR-L-550
1.	Distance to Spot Ratio	12 : 1
2.	Temperature Range	-25°C~560°C(-13°F ~1040°F)
3.	Accuracy	± (1.5% + 1°C) ± (1.5% + 1°F)
4.	Thermopile	6 ~ 14 mm
5.	Repeatability	±1°C (±2°F)
6.	Resolution	0.2°C / 0.4°F
7.	Response Time	500 ms
8.	Auto Power OFF	15 sec
9.	Emissivity	0.99/0.95/0.89/0.85/0.79/0.75
10.	°C / °F Selectable	-
11.	Backlight	-
12.	Laser Sight Switchable	-
13.	Power Supply	9V battery
14.	Dimensions in mm	170 x133 x 45 mm
15.	Weight Approx.	187 gms. approx.

Table 3: Properties of cutting oils

Sr. No	Properties ► Cutting oils ▼	Flash point 0 c	Density at 27 0c g/cm3	Viscosity at 40 0c cst	Acid Value
1.	Coconut Oil	290	0.920	25.8	0.359
2.	Groundnut oil	318	0.909	30.1	1.18
3.	Karanja Oil	245	0.928	39.1	10.3
4.	Soybean Oil	325	0.91	28.3	0.040
5.	Sunflower Oil	320	0.915	29.7	0.043

III. Work Piece:

AISI 4130 MS material is being widely used for various industrial applications so experiments is been carried out by turning cylindrical AISI 4130 MS bars (figure 5) with a diameter of 60 mm and length of 12 cm on lathe machine at different cutting speeds, feeds and cutting depths under dry wet and MQL conditions. The chemical composition and mechanical properties of AISI 4130 MS are given in the table 3and 4 respectively.



Figure 5: AISI 4130 MS bars

Table 4: Chemical composition of work piece

Grade	Composition in %							
	C	Mn	Si	P	S	Cr	Ni	N
AISI 4130	0.30	0.52	0.24	0.017	0.011	1.06	0.017	0.22

Table 5: Mechanical properties of work piece

Grade	Yield Strength (Mpa)	Tensile strength (Mpa)	Elongation (%)	Vickers Hardness (HV)
AISI4130	365	636	24	261

Table 6: Cutting Tool Specifications

Parameter	Material/ Dimension
Material	Coated carbide
Back Rake Angle	12°
End Relief	10°
Side Rake Angle	12°
End Cutting Edge Angle	30°
Side Cutting Edge Angle	15°
Nose Radius	0.8mm

6. EXPERIMENTAL SETUP

For measuring temperature we using Infrared thermometer. Experimental-Setup consists of following parts: -The standalone temperature measurement work-station consisted of an infrared thermometer, mounted on the cross slide of the lathe and placed directly over the tool rack face during the cutting tests, and the analysis software mounted on a personal computer. Tool temperature was measured by Infrared thermometer. To record the data written software were used. The schematic description and photo of experimental set-up are shown in Figure No. 6

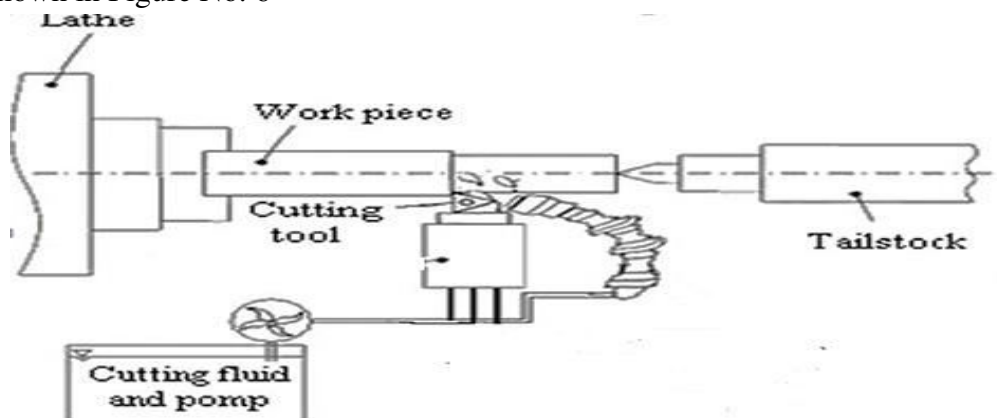


Figure 6: Experimental-Setup for temperature measurement with Infrared Pyrometer

7. OBJECTIVES OF THE PROJECT

The objectives of this work are summarized below:-

- i. Measure the temperature of cutting tool at various point & work piece for dry cutting and using different cutting fluids.
- ii. Verify effect of temperature on surface roughness and tool life.
- iii. Measuring effect on temperature using vegetable based cutting fluid.
- iv. Verify this by using CFD analysis Comparison of Experimental and CFD analysis of from available literature.

8. SCOPE OF THE PROJECT

Though lots of research work done in the field of thermal analysis of single point cutting tool, but using different CFs no research or very less research carried out. Also all research regarding done only on dry condition in the region of tool wear like various speed, feed, and depth of cut. Very few researchers done their work in the field of varying CFs with different percentage CFs & flow rate with effect of temperature etc. If combine different CFs & flow rate then performance of single point cutting tool increases.

9. CONCLUSION

As the single point cutting tool is one of the major part of machining process, to increase tool efficiency and performance along with its life. It is very necessary to analysis it by thermally and statically. Because increase in depth of cut and speed friction increase which causes thermal stress along the tool. Many researcher works on this, to improve the life & efficiency by doing different analysis using different cutting fluids and experimental set up with different models but still lots of works to be done in future.

10. ACKNOWLEDGMENT

First and foremost, I would like to express my deep sense of gratitude and indebtedness to my guide Prof. Ghuge N.C. for his invaluable encouragement, suggestions and support from an early stage of this seminar and providing me extraordinary experiences throughout the work. Above all, his priceless and meticulous supervision at each and every phase of work inspired me in innumerable ways. I am highly grateful to Dr.G.K.Kharate, Principal, Matoshri College of Engineering and Research Center, Eklahare, Nashik, Prof.J.H.Bhangale, Head, Department of Mechanical Engineering and Prof.D.D.Palande PG coordinator, Department of Mechanical Engineering for their kind support and permission to use the facilities available in the Institute.

11. REFERENCES

- [1] Maheshwari N Patil, Shreepad Sarange ,” Numerical Analysis to Determine the Distribution of Tool Forces and Temperatures of Single Point Cutting Tool ”, International Journal of Science and Research ,volume 3,issue 4, April 2014.

- [2] Yung-Chang Yena, jorg Sohnerb, Blaine Lillya, TaylanAltana,” Estimation of tool wear in orthogonal cutting using the finite element analysis”, Journal of Materials Processing Technology. 146, (2004), 82–91.
- [3] Sushil D. Ghodam,” Temperature measurement of a cutting tool in turning process by using tool work thermocouple” International Journal of Research in Engineering and Technology, Volume: 03, Issue: 04, Apr-2014.
- [4] S. H. Rathod, Mohd. Raze,” Finite Element Analysis of Single Point Cutting Tool” International Journal of Modern Engineering Research (IJMER), Vol. 4 Iss. 3, Mar. 2014.
- [5] S. H. Rathod, Mohd. Razik.” Review Study on Finite Element Analysis of Single Point Cutting Tool” International Journal of Engineering Research and Development, Volume 9, Issue 1 (November 2013).
- [6] Fang du, Michel R. Lovell, Tim W. Wu, “Boundary element method analysis of temperature fields in coated cutting tool.”International journal of solid and structures, 38, 2001.
- [7] Dinca, I. Lazoglua, A. Serpenguzel, “Analysis of thermal fields in orthogonal machining with infrared imaging” journal of materials processing technology,198, (2008).
- [8] Steven Y. Liang Yong Huang,” Effect of Cutting Conditions on Tool Performance in CBN Hard Turning” Manufacturing Processes, Vol. 7,No. 1, 2005.
- [9] Rogerio Fernandes Brito, Solidonio Rodrigues de Carvalho, Sandro Metrevelle Marcondes de Lima Silva, Joao Roberto Ferreira, “Thermal analysis in coated cutting tools “International Communications in Heat and Mass Transfer, 36, (2009)314–321.
- [10] N.A.Abukhshim, P.T.Mativenga, M.A.Sheikh,” Heat generation and temperature prediction in metal cutting: A review and implications for high speed machining”, International Journal of Machine Tools & Manufacture, 46, (2006).
- [11] Gourab Chakraborty, Satyabrata Podder & Uttam Roy, “Three dimensional thermal mapping of single point cutting tool using finite element method and its experimental verification, “International Journal of Mechanical and Production Engineering Research and Development, Vol. 3, Issue 1, Mar 2013.
- [12] AnshuD.Jayal, A.K.Balaji,”Effects of cutting fluid application on tool wear in machining: Interactions with tool-coating and tool surface features”, Wear, 267,(2009).
- [13] Baburozcelik,Emelkuram, Erhandemirbas And EmrahSik,”Effects of vegetable-based cutting fluids on the wear in drilling”,Sadhan`a Vol. 38, Part 4, August 2013, pp.687–706.
- [14] Patrick Adebisi Olusegun Adegbuyi, Ganiyu Lawal; Oluwatoyin Oluseye,” Analyzing the effect of cutting fluids on the mechanical properties of mild steel in a turning operation”, American Journal of Scientific and Industrial Research, 2(1): 1-10. 2011.
- [15] P. Mottaghizadeh, M. Bagheri,” 3D Modeling of Temperature by Finite Element in Machining with Experimental Authorization”, World Academy of Science, Engineering and Technology 68, 2012.
- [16] Ismail Lazoglu, Yusuf Altintas,”Prediction of tool and chip temperature in continuous and interrupted machining”, International Journal of Machine Tools & Manufacture 42,(2002), 1011–1022.
- [17] Desaa, S. Bahadur, “The effect of lubricants in single point scratching and abrasive machining of alumina and silicon nitride.”Wear, 251 (2001), 1085–1093.
- [18] D.O. Sullivan, M. cotterell, “Temperature measurement in single point turning.”Journals of materials processing technology 118 (2001) 301-308.
- [19] Deepak Lathwal,Mr. Deepak Bhardwaj,”study and analysis of single point cutting Tool under variable rake angle” International journal for research in applied science and engineering technology, vol.1,Issue I, August 2013 .
- [20] Nilesh C Ghuge, Dhatrak V.K., Dr.AM.Mahalle,” Minimum Quantity Lubrication” IOSR Journal of Engineering (IOSRJEN) ISSN: 2250-3021 Volume 2, Issue 8 (August 2012), PP 55-60.

Formation Of Virtual Topology On Fiber Optic Networks With Source Based Approach On Link Failure Networks- A Comparative Study

Paper ID	IJIFR/V3/ E9/ 063	Page No.	3484-3494	Subject Area	Computer Engineering
KeyWords	Optical Fiber, WDM, Virtual Topology, Link Failure, Throughput, Delay, Equipment Cost, Configurability				

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Abstract

The current trend in the industry is to minimize cutting fluid use. In machining of work piece, surface roughness and cutting tool life are greatly affected by increasing temperature. Machining demands optimum selection of fluids and application strategies for various operations. Hence for selecting best cutting fluid, the complete thermal analysis is needed. This project focuses on vegetable based cutting fluids (VBCF's) and machining with these fluids. This work consists of study of temperature distribution with respect to different cutting conditions. Observations are to be made by varying depth of cut and feed. In this work, performance of three VBCF's sunflower oil, coconut oil, soybean oil and Non edible vegetable oil as jatropha or karanja are compared experimentally in terms tool temperature, work piece temperature, tool life by using single point cutting tool. Effect of different parameters on temperature is to be studied. This experimental result is to be validated by using thermal (CFD) analysis. By using experimental result and CFD analysis optimized cutting fluid to be found from sunflower oil, coconut oil, soybean oil.

1. INTRODUCTION

Optical networks are promising candidate to meet the bandwidth demands for various emerging multimedia applications such as web applications, video on demand, multimedia conference, image access and distribution, home broadband services etc. [1] An All-optical WDM network consists of optical cross-connects (OXC's) interconnected by fiber

links, in which an OXC can switch an optical signal from an input and output link without performing optoelectronic conversion. Given a set of connection requests, the problem of setting up light paths by routing and assigning a wavelength to each connection is called routing and wavelength assignment (RWA) problem [2].

WDM networks have gained tremendous popularity due to their ability to tap the enormous amount of bandwidth in an optical fiber. Their growing popularity and bandwidth capacity have made survivability in these networks is an important aspect.

The physical topology of a WDM network consists of nodes interconnected with a pair of fiber links. The fact that fiber links pass through conduits and right-of-way give rise to single-point failures. Such failures might result in failure of multiple links in the physical topology.

The virtual topology at the optical layer consists of a sub-set of nodes of the physical layer and an interconnection of logical links. Often the virtual topology is different from the physical topology. Given the physical topology and the traffic pattern the virtual topology design problem is to design a virtual topology considering throughput, delay, equipment cost and configurability. If we cannot setup a light path for a connection request, then it is blocked. A well-designed RWA algorithm is critically important to improve the performance of WDM networks. RWA problem can be classified into static RWA and dynamic RWA problems.

- The failure in optical communication networks such as accidental link disruption or switching device disorder will affect a huge amount of bandwidth in transmission, thus survivability is one of the most important issues in the design of WDM optical networks [3].
- There are two kinds of failure in WDM networks: link failure and node failure. It is observed that most modern switching devices are equipped built-in redundancy to improve their reliability. Therefore, link failure is more concern than node failure. Many studies in the literature justify that single link failure happens much more frequent than multiple link failures, thus the single link failure model attract more attentions in the optical survivability research.

The virtual topology design problem is known to be NP-hard [4], [5]. A survey of virtual topology design algorithms is presented in [6]. The virtual topology design problem was decomposed into four sub-problems [7], topology sub problem, virtual topology routing sub problem, wavelength assignment sub problem and traffic routing sub problem.

• **Failure Occurrence**

As optical networks are being speedily deployed on a worldwide scale, protecting a network from different varieties of faults and failures have become peculiarly main in a WDM network, failure could occur in any component of the network. Optical networks additionally undergo different kind of failures. [8] Link node and channel screw ups are very common. Node disasters arise in view that of gear failure at community nodes & hyperlink screw ups are most of the time brought about by using fiber cuts which impair carrier continuity to numerous numbers of users. A channel failure is mostly triggered

with the aid of the failure of transmitting and/or receiving equipment running on that channel. [9] One among fundamental offerings of operation network that have to be deployed effectually is reliability. With a view to installation a reliable networking method, one wants to shield transmitted sign over unreliable hyperlinks. Network capable of shielding itself against failure is called survivability. There are practically two important strategies to obtain survivability of a community: defence and restoration. Defence pre plans backup routes which can be used within the event of a failure. Restoration addresses screw ups with the aid of finding free wavelength channels for backup after a failure happens. [10]

2. PROPOSED WORK

Transport network with an optical Layer between the higher electrical layer and the lower physical medium layer are capable of meeting new challenges posed by the increasing demand for bandwidth. The optical layer is protocol –transparent and can support different kinds of services and protocols at higher layers. The number of wavelengths that can be supported on a fiber is limited to a few hundreds only.

WDM networks are prone to failures of components such as links, nodes and switches. These networks carry high volumes of traffic, failures may have several consequences, it is imperative that these network have fault tolerance capability.

The network has a group of n connexion points i , ($i = 1$ to n) and a group of distances d_{ij} between pairs of points (i, j) . The full range of stated distances can link to the number of possible routes between adjacent pairs of points, however there will be minimum of $n-1$ such connections, because it is assumed that no point with in the network is isolated. Also, in presenting the data for the network it is the d_{ij} are positive, which direction d_{ij} and d_{ji} measure given so competently different directions are distinguished. The distances of the forward and reverse directions might different i.e. it should be that $d_{ij} \neq d_{ji}$.

The input for the problem consists of two directed graphs (each directed link is made up of two different directional optical fibers):

$G_{pt}(V;L)$ representing the physical topology, and

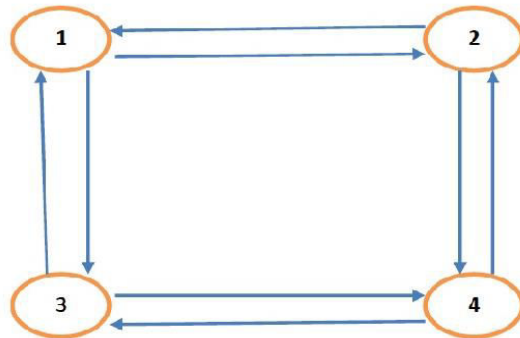
$G_{lt}(V;C)$ representing the logical topology.

V is the set of nodes in the network, and N is the number of nodes jVj .

L is the set of links of the physical network. It is represented as an $n \in N$ matrix, for which entry $l_{mn} = 1$ if there is a link between nodes m and n and $l_{mn} = 0$ otherwise.

A mapping is evaluated by disconnecting the links l_{mn} of physical graph G_{ph} one by one. For each l_{mn} , all clear channels csd for which $rsd_{mn} = 1$ are disconnected in G_{lt} , giving rise to a partial logical graph $G_{mn lo}$

Using the clear channels of this partial graph, we try to find a path connecting the endpoints s and d of each of the disconnected clear channels csd . If s and d are disconnected in $G_{mn lo}$, we say that csd is unsurvivable on l_{mn} , and call $fcsd$;

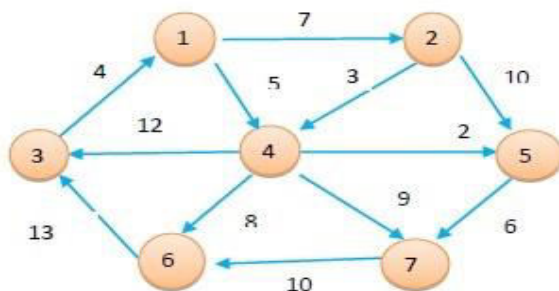
$$\begin{bmatrix} 0 & 8 & 7 & \infty \\ 10 & 0 & \infty & 8 \\ 7 & \infty & 0 & 5 \\ \infty & 3 & 9 & 0 \end{bmatrix}$$


In The above traffic matrix is based on 4-node traffic matrix, weighted is assigned to random and based on network. in the formation of virtual topology is implemented on source based method. If physical topology we can one or two link failure occurs. 2->4(8): 2->4(8) & 1->3(7) then the formation of virtual topology different objects utilisation of light paths, utilisation of wave lengths, and usage of hop weight, maximum congestion and minimum congestion is clearly observed.

Table 1: 4-node after link failure for Source based approach

	Node	trans	Light paths	Wave lengths	p-hops	Hop weight	Avg hops	Max-congestion	Min-congestion
Source based	4	1	4	2	4	32	1	1 -> 0 (10)	2 ->3(5)
	4	2	8	3	8	57	1	1 -> 0 (10)	3 ->1(3)
Source-Ink1	4	1	3	2	3	24	1	3 -> 2 (9)	2 ->0(7)
	4	2	7	3	7	49	1	1 -> 0 (10)	3 ->1(3)
Source-Ink2	4	1	3	2	3	24	1	3 -> 2 (9)	2 ->0(7)
	4	2	6	3	6	42	1	1 -> 0 (10)	3 ->1(3)

In the above table 1 implementing source based approach on 4-node up to 2 transceivers shows the results up to 2 link failures obtained for several objective functions like the utilization of Light paths, Wave Lengths, Hop Weight, Average hop Weight, Maximum Congestion and Minimum Congestion



7-node network

$$\begin{bmatrix} 0 & 7 & \infty & 5 & \infty & \infty & \infty \\ \infty & 0 & \infty & 3 & 10 & \infty & \infty \\ 4 & \infty & 0 & \infty & \infty & \infty & \infty \\ \infty & \infty & 12 & 0 & 2 & 8 & 9 \\ \infty & \infty & \infty & \infty & 0 & \infty & 6 \\ \infty & \infty & 13 & \infty & \infty & 0 & \infty \\ \infty & \infty & \infty & \infty & \infty & 10 & 0 \end{bmatrix}$$

In The above traffic matrix is 7-node traffic matrix, weighted is assigned to random and based on network.in the formation of virtual topology is implemented on source based approach. If physical topology we can observe three link failures occurs. 4->6(8): 4->6(8)& 6->3(13): and 4->6(8), 6->3(13) and 1->4(5) then the formation of virtual

topology different objects utilisation of light paths, utilisation of wave lengths, and usage of hop weight, maximum congestion and minimum congestion is clearly observed.

Table 2: 7-node after link failure for Source based approach

	Node	trans	Light paths	Wave lengths	p-hops	Hop weight	Avg hops	Max-congestion	Min congestion
Source based	7	1	6	8	6	49	1	3 -> 2 (12)	2 ->0(4)
	7	2	10	9	10	79	1	5 -> 2 (13)	1 ->3(3)
	7	3	11	10	11	87	1	5 -> 2 (13)	1 ->3(3)
	7	4	12	11	12	89	1	5 -> 2 (13)	3 ->4(2)
Source-Ink1	7	1	6	10	6	49	1	3 -> 2 (12)	2 ->0(4)
	7	2	10	11	10	79	1	5 -> 2 (13)	1 ->3(3)
	7	3	11	12	11	81	1	5 -> 2 (13)	3 ->4(2)
	7	4	11	13	11	81	1	5 -> 2 (13)	3 ->4(2)
Source-Ink2	7	1	6	10	6	49	1	3 -> 2 (12)	2 ->0(4)
	7	2	9	11	9	66	1	3 -> 2 (12)	1 ->3(3)
	7	3	10	12	10	68	1	3 -> 2 (12)	3 ->4(2)
	7	4	10	13	10	68	1	3 -> 2 (12)	3 ->4(2)
Source-Ink3	7	1	6	10	6	49	1	3 -> 2 (12)	2 ->0(4)
	7	2	8	11	8	61	1	3 -> 2 (12)	1 ->3(3)
	7	3	9	12	9	63	1	3 -> 2 (12)	3 ->4(2)
	7	4	9	13	9	63	1	3 -> 2 (12)	3 ->4(2)

In the above Table-2 implementing source based on 7-node up to 4 transceivers shows the results up to 3 link failures obtained for several objective functions like the utilization of Light paths, Wave Lengths, Hop Weight, Average hop Weight, Maximum Congestion and Minimum Congestion

0	93	89	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
39	0	14	77	∞	∞	∞	∞	∞	44	∞	∞	∞	∞
78	∞	0	∞	∞	39	∞	∞	∞	∞	43	98	∞	∞
∞	5	∞	0	∞	∞	33	∞	25	∞	∞	∞	∞	∞
∞	26	∞	∞	0	∞	∞	28	∞	23	∞	∞	∞	∞
∞	∞	7	∞	∞	0	∞	97	40	∞	∞	∞	∞	∞
∞	∞	∞	61	∞	∞	0	∞	∞	36	∞	∞	∞	42
∞	∞	∞	∞	61	49	∞	0	∞	17	∞	∞	∞	∞
∞	∞	∞	12	∞	57	∞	∞	0	∞	∞	∞	∞	∞
∞	∞	∞	∞	42	∞	97	47	∞	0	∞	∞	∞	∞
∞	29	∞	∞	∞	∞	∞	∞	∞	∞	0	41	28	∞
∞	∞	54	∞	∞	∞	∞	∞	∞	∞	63	0	∞	87
∞	∞	26	∞	∞	∞	∞	∞	∞	∞	81	∞	0	3
∞	∞	∞	∞	∞	∞	43	∞	∞	∞	∞	4	58	0

In The above traffic matrix is 14-node(NSFNET) traffic matrix, weighted is assigned to random and based on network.in the formation of virtual topology is implemented on source based approach. If physical topology we can observe four link failures occurs. 13-

>11(81): 13->11(81)& 13->14(3): 13->11(81) 13->14(3) 10->8(47): 13->11(81) 13->14(3) 10->8(47) 13->3(26) then the formation of virtual topology different objects light paths, wave lengths, and usage of hop weight, maximum congestion and minimum congestion is clearly observed.

Table 3: 14 node (NSFNET) after link failure for Source based approach

	Node	trans	Light paths	Wave lengths	p-hops	Hop weight	Avg hops	Max-congestion	Min congestion
Source based	14	1	12	6	12	792	1	2 -> 12 (98)	13 ->11(4)
	14	2	25	7	25	1437	1	2 -> 12 (98)	8 ->3(12)
	14	3	38	8	38	1852	1	2 -> 12 (98)	12 ->13(3)
	14	4	42	9	42	1936	1	2 -> 12 (98)	12 ->13(3)
Source-Ink1	14	1	12	6	12	737	1	2 -> 12 (98)	13 ->11(4)
	14	2	25	7	25	1437	1	2 -> 12 (98)	8 ->3(12)
	14	3	37	8	37	1771	1	2 -> 12 (98)	12 ->13(3)
	14	4	41	9	41	1855	1	2 -> 12 (98)	12 ->13(3)
Source-Ink2	14	1	12	6	12	737	1	2 -> 12 (98)	13 ->11(4)
	14	2	25	7	25	1437	1	2 -> 12 (98)	8 ->3(12)
	14	3	36	8	36	1768	1	2 -> 12 (98)	13 ->11(4)
	14	4	40	9	40	1852	1	2 -> 12 (98)	13 ->11(4)
Source-Ink3	14	1	12	6	12	737	1	2 -> 12 (98)	13 ->11(4)
	14	2	26	7	26	1416	1	2 -> 12 (98)	8 ->3(12)
	14	3	35	8	35	1721	1	2 -> 12 (98)	13 ->11(4)
	14	4	39	9	39	1805	1	2 -> 12 (98)	13 ->11(4)
Source-Ink4	14	1	11	6	11	711	1	2 -> 12 (98)	13 ->11(4)
	14	2	25	7	25	1390	1	2 -> 12 (98)	8 ->3(12)
	14	3	35	8	35	1721	1	2 -> 12 (98)	13 ->11(4)
	14	4	38	9	38	1779	1	2 -> 12 (98)	13 ->11(4)

In the above Table-3 implementing source based on 14-node up to 4 transceivers shows the results up to four link failures obtained for several objective functions like the utilization of Light paths, Wave Lengths, Hop Weight, Average hop Weight, Maximum Congestion and Minimum Congestion

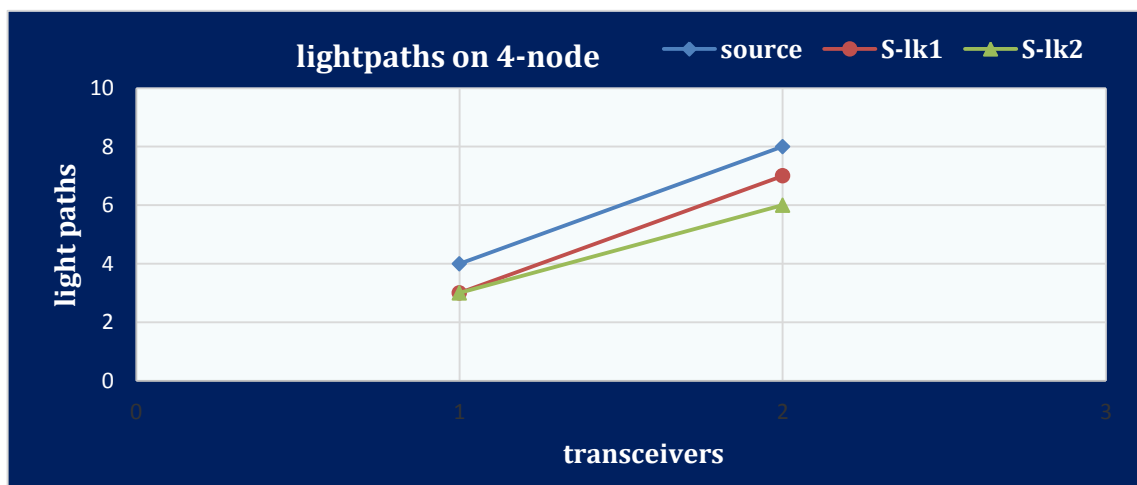


Figure 1: 4-node light paths Vs transceivers

In the above figure, utilisation of light paths on 4-node with 2 transceivers with Source based approach with link failures1 and link failures2

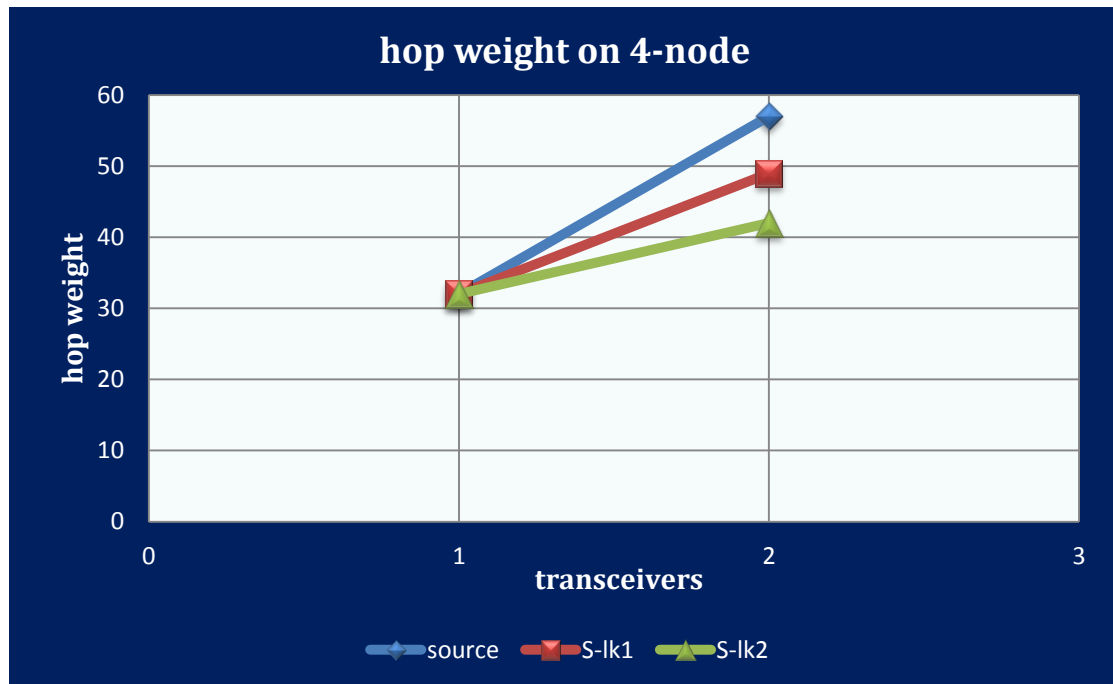


Figure 2: 4-node hop weight Vs transceivers

In the above figure, usage of hop weight on 4-node with 2 transceivers with Source based approach with link failures1 and link failures2

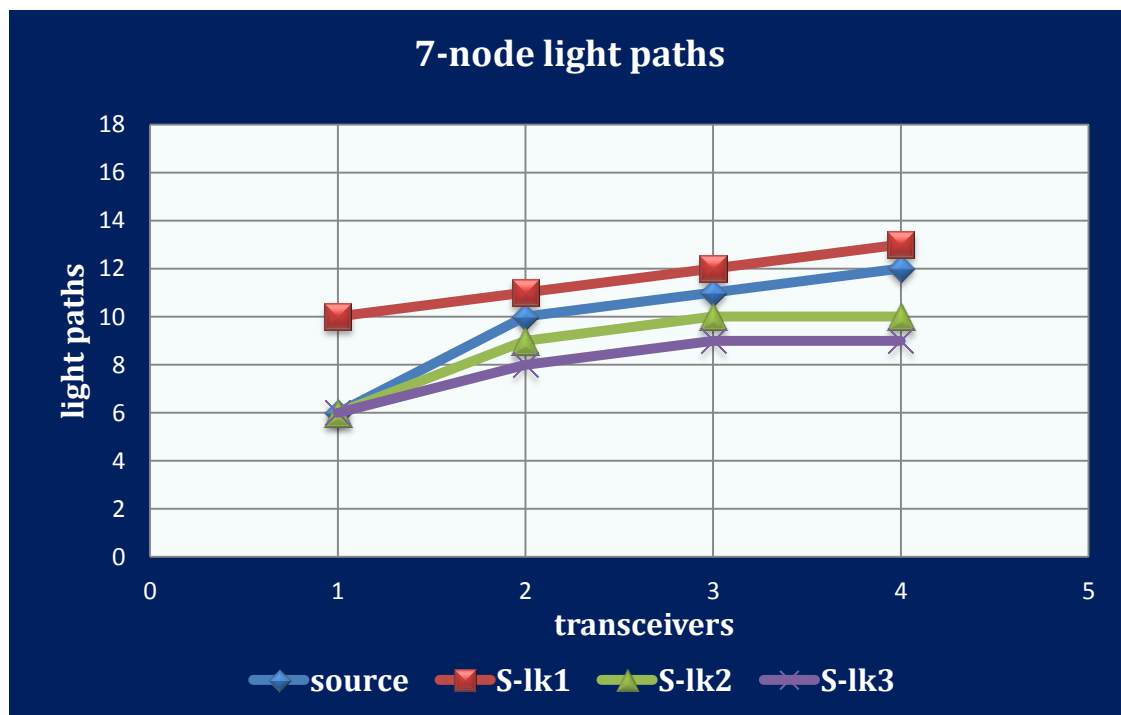


Figure 3: 7-node light paths Vs transceivers

In the above figure, utilisation of light paths on 7-node with 4 transceivers implementing source based approach with link failures1, link failures2 and link failure3.

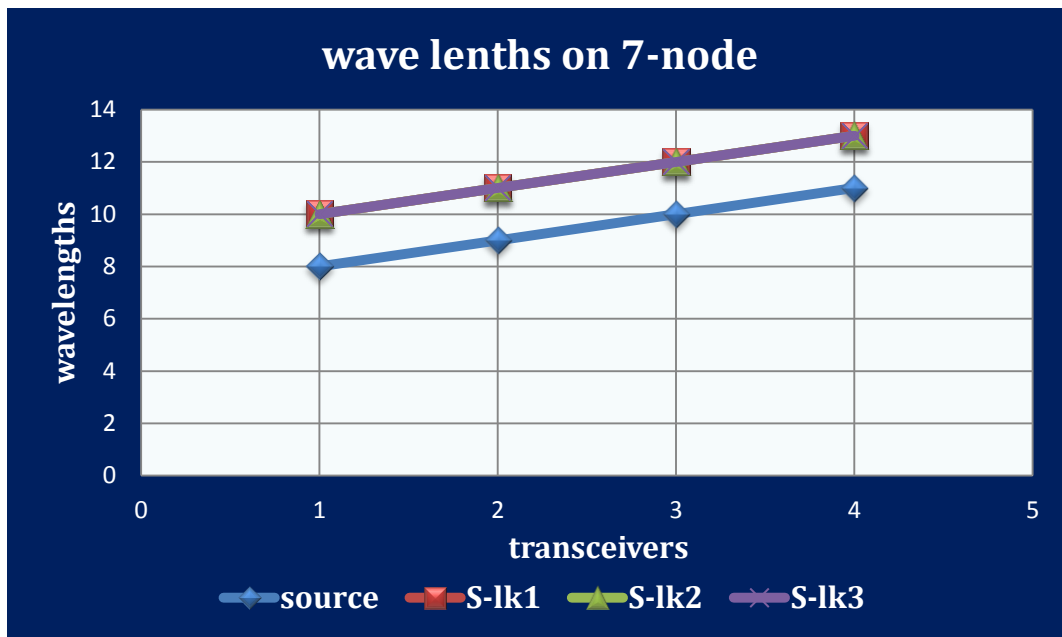


Figure 4: 7-node wave lengths Vs transceivers

In the above figure, utilisation of wave lengths on 7-node with 4 transceivers implementing Source based approach with link failures1, link failures2 and link failure3

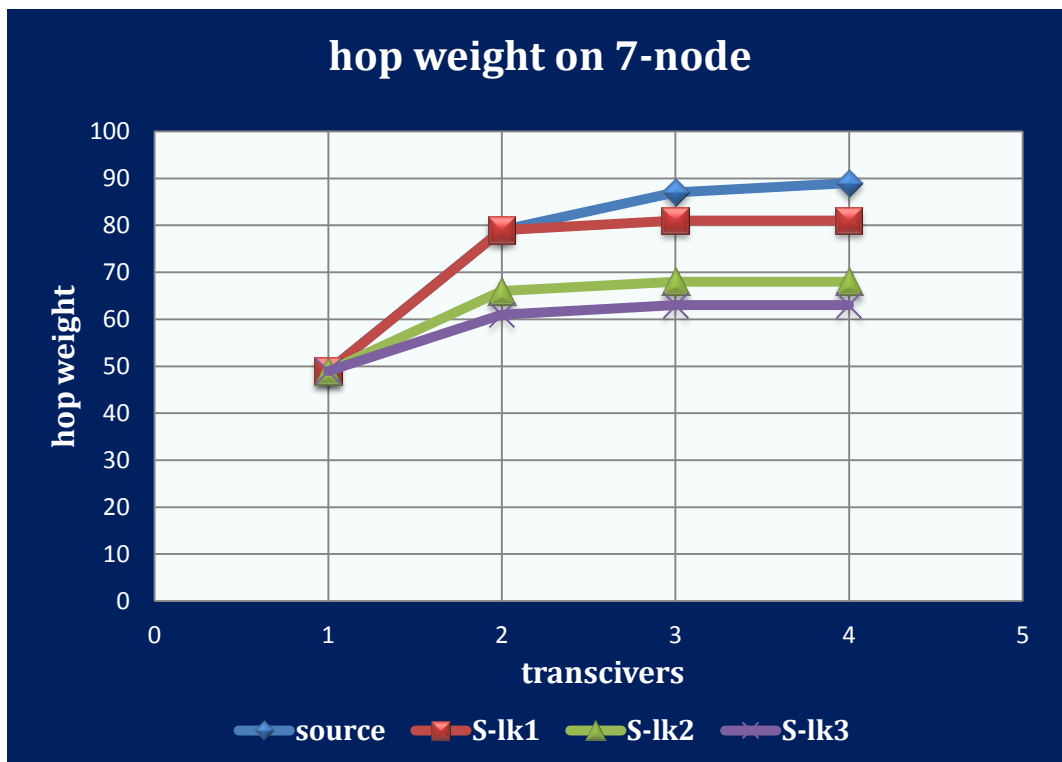


Fig 5: 7-node hop weight Vs transceivers

In the above figure, usage of hop weight on 7-node with 4 transceivers implementing Source based approach with link failures1, link failures2 and link failure3

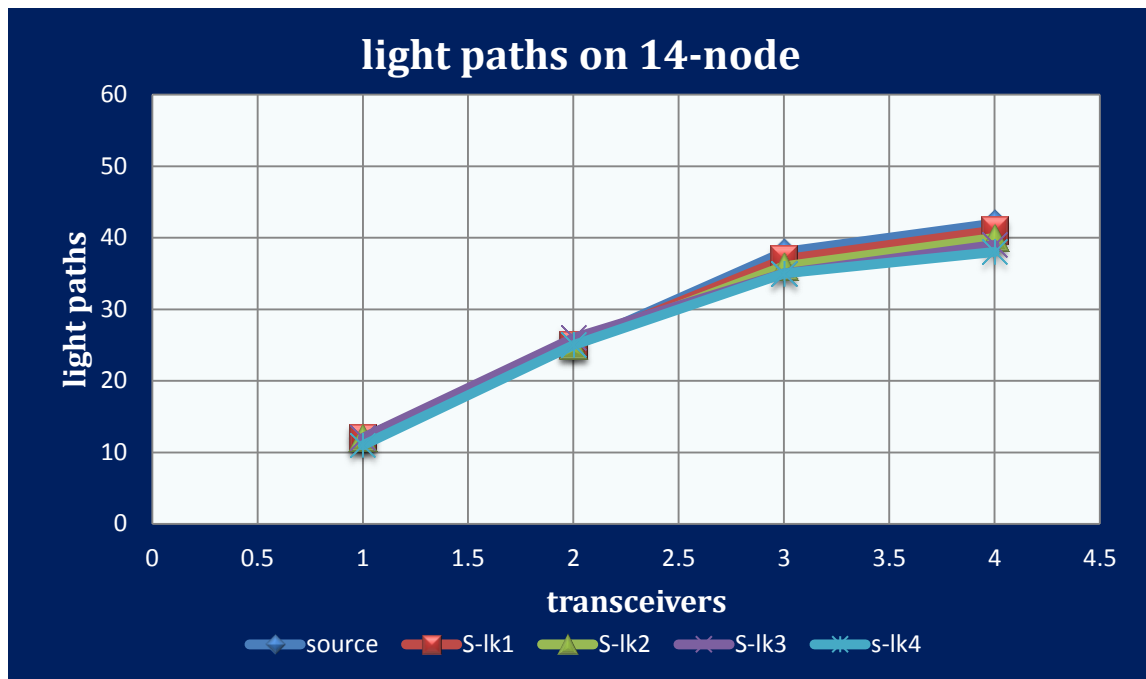


Figure 6: 14-node (NSFNET) light paths Vs transceivers

In the above figure, utilisation of light paths on 14-node with 4 transceivers implementing Source based approach with link failures1, link failures2, link failure3 and link failure 4

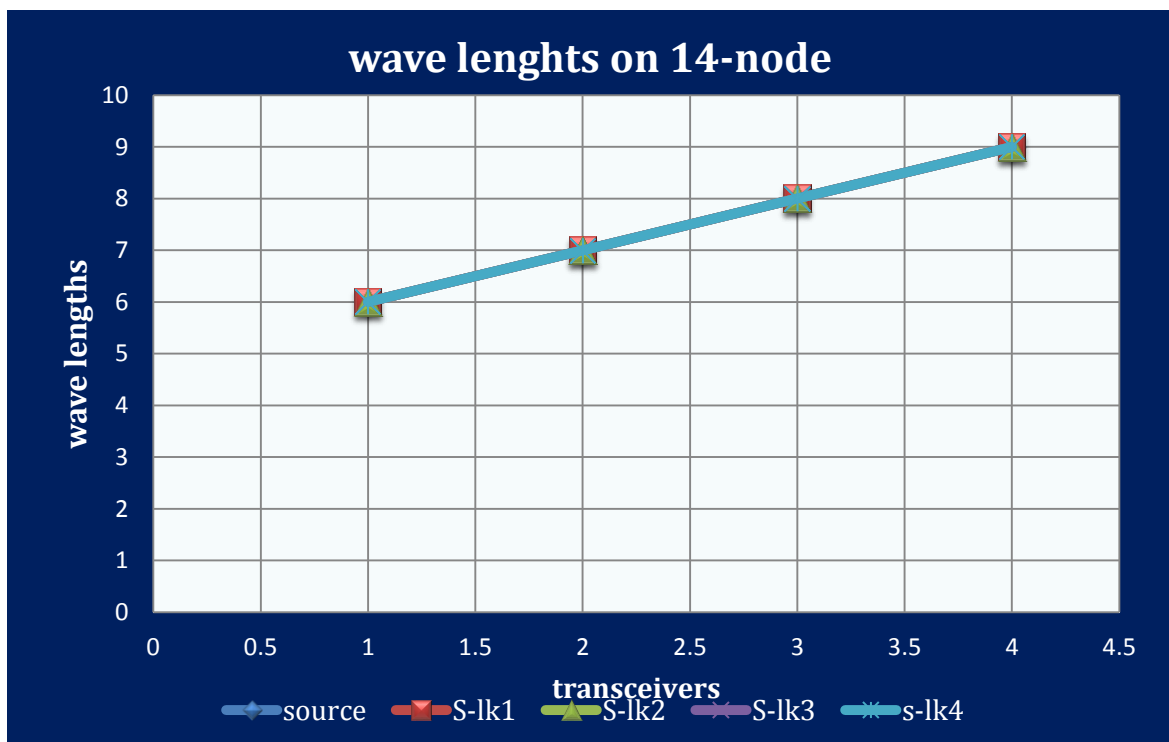


Figure 7: 14-node (NSFNET) wave lengths Vs transceivers

In the above figure, utilisation of wave length on 14-node with 4 transceivers implementing Source based approach with link failures1, link failures2, link failure3 and link failure 4

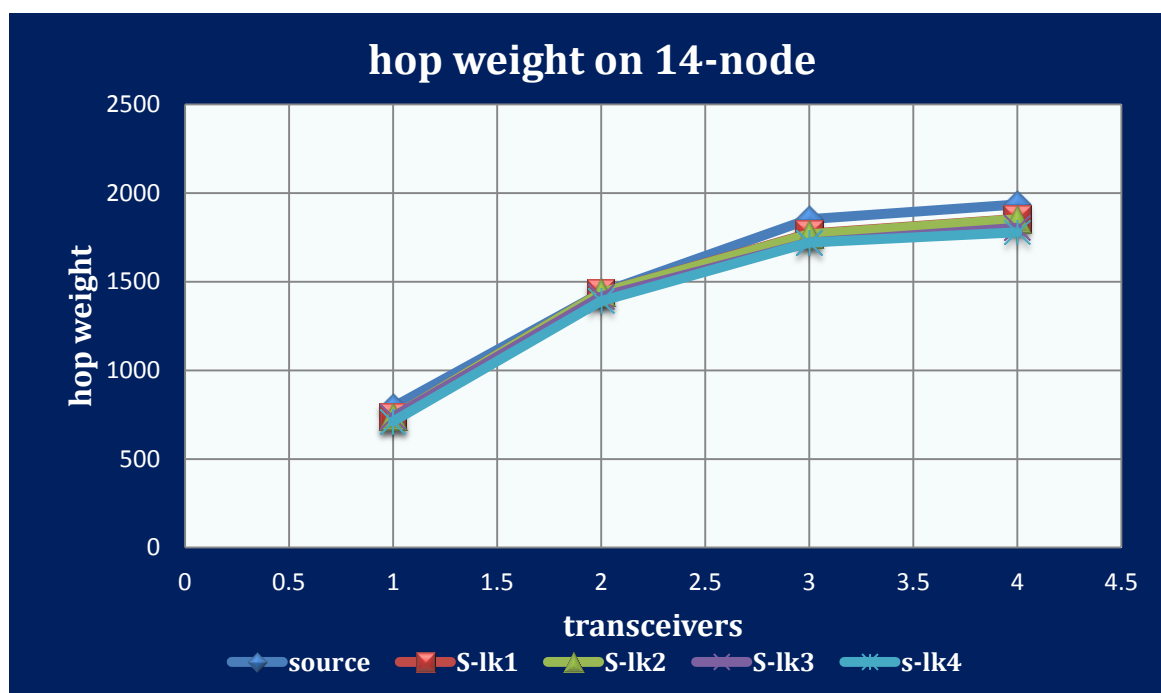


Fig 8: 14-node (NSFNET) hop weight Vs transceivers

In the above figure, usage of hop weights on 14-node with 4 transceivers implementing Source based approach with link failures1, link failures2, link failure3 and link failure 4

3. CONCLUSIONS

The paper emphasizes on the formation of Virtual Topology using Source based approach implemented by varying Opto-Electric transceivers. Proposed approach is implemented on 4-node, 7-node and 14-node NSFNET traffic matrices. Implementation is made on Complete Network and A Network with Link Failures in optical Fiber. The Results are effectively compared by satisfying different objective functions like utilization of Light paths, Wave Lengths, Hop Weight. The Results are observed as follows:

Figs: 1 to 2: On 4-node Network Light paths and hop weight is maximum on complete network.

Figs: 3 to 5: On 7-node Network, if one link failure occurs the Light paths and hop weight is maximum as equal to the complete network. After failure of three links in the Network the stability in the efficiency of wavelengths is observed.

Figs: 7 to 9: On 14- node (NSFNET) networks light paths, wave lengths and hop weight is maximum on complete network. Whereas slightly difference in the Link Failure Networks.

4. REFERENCES

- [1] R. Ramaswami et al., "Optical networks: a practical perspective," Morgan Kaufmann Publishers Inc., San Francisco, CA, 2002.
- [2] H. Zang, et al., "A Review of Routing and Wavelength Assignment Approaches for Wavelength-Routed Optical WDM Networks," in Optical Networks Magazine, vol. 1 Pp.47-63, Jan. 2000.

- [6] Pin-Han Ho, "State-of-the-Art Progresses in Developing Survivable Routing Strategies in the Optical Internet", IEEE Communications Surveys and Tutorials, vol. 6, No. 4, the fourth quarter, 2004.
- [7] E. Modiano and A.Narula-Tam, "Survivable Light path Routing: A New Approach to the design of WDM Based Networks," *IEEE Journal on Selected Areas in Communications*, vol. 20, no. 4, pp. 800-809, May 2002.
- [8] D. Banerjee and B. Mukherjee, "A practical approach for routing and wavelength assignment in large wavelength routed optical networks," *IEEE Journal of Selected Areas in Communications* vol. 14, no. 5, pp. 903-908, June 1996.
- [9] R. Ramaswami and K. N. Sivarajan, "Design of logical topologies for wavelength-routed optical networks," *IEEE Journal of Selected Areas in Communications* vol. 14, no. 5, pp. 840-851, June 1996.
- [10] R. Dutta and G. N. Rouskas, "A Survey of Virtual Topology Design Algorithms for Wavelength Routed Optical Networks," *Opt. Networks Mag.*, vol. 1, no. 1, pp. 73-89, Jan. 2000.
- [11] Sateesh Chandra Shekhar, "Survivable Multicasting in WDM Optical Networks", By Bachelor of Engineering, University of Pune, August 2004.
- [12] D. Zhou and S. Subramaniam, Survivability in Optical Networks, IEEE Network, volume 14, no. 6, pages 16-23, November 2000.
- [13] S.aravindh and mr.g.michael " hybrid of ant colony optimization and genetic algorithm for shortest path in wireless mesh NETWORKs", Journal of Global Research in Computer Science " Volume 3, No. 1, January 2012

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A Review On Power Consumption In Datacentres

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Key Words	Cloud Data Center, Hadoop ,Virtualization, Dynamic Energy Management & Server Consolidation				

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Abstract

The rapid growth of data volume brings big challenges to the data center computing, and energy efficiency is one of the most concerned problems. Researchers from various fields are now proposing solutions to green the data center operations. Power usage effectiveness metric plays an important role in the energy saving research. However, the existing usage effectiveness metrics focus on measuring the relationship between the total facility energy consumed and the IT equipment energy consumed, without reflecting the energy efficiency of applications. Energy consumption can be reduced by employing dynamic energy management techniques both in hardware and software levels at cloud data centers. This paper surveys various issues related to dynamic energy management in cloud data centers.

1. INTRODUCTION

Data Centers have emerged as a back-bone infrastructure, housing large number of IT equipments such as servers, data storage, network devices, power and cooling devices etc. that facilitate the development of wide variety of services offered by the cloud. Currently, several service providers such as Amazon, Google, Yahoo, Microsoft, IBM and Sun, have their own data centers to provide the scalable services to a large customer base. With the rapid development of IT industry and increasing demand for cloud services, the number of data centers has increased. These data centers consume enormous amount of energy to

process its services resulting in increased energy consumption. The surging energy consumption of these data centers has become a serious concern from both economic and environmental standpoints. In this paper, an approach for reducing the power consumption of a system had been proposed. This approach can be used to save the power and also help us to use our system and resources in an eco-friendly way. Approach is being supported by an algorithm, flowchart and sequence diagram and for implementing the algorithm HADOOP tool is used.

2. HISTORY OF GREEN COMPUTING:

The importance of green technology was made evident when computing attained critical mass in the early 1990s. The late 1990s and early 2000s witnessed many regulatory milestones, and the recent years witness companies innovating to incorporate green technology. Green technologies the application of environmental science to offer economically viable solutions that conserve the natural environment and resources, and curb the negative impacts of human involvement.[4] The proliferation of data centers required the constant addition of server, cooling and ventilation equipment that led to an ever-increasing demand of energy and increased presence of toxic and hazardous substances such as lead, mercury, cadmium, and others. This made people look at ways to apply green technology in computing to mitigate the serious environmental and health concerns.

3. GREEN COMPUTING TECHNIQUES TO MANAGE POWER IN COMPUTING SYSTEM

Recently, several techniques have been proposed for managing power consumption of data centers [5]. Due to large power consumption levels of data centers, use of these techniques has become essential to maintain both energy efficiency and cost efficiency. In recent years, researchers have proposed several techniques for managing power consumption in data centers. While it is very difficult to draw sharp boundaries of classification, we classify the techniques in the following four types.

- i.) DVFS (dynamic voltage/frequency scaling) based techniques
- ii.) Techniques which transition the server/node to low-power or turned-off state; or use server consolidation based approach to allocate only required amount of server resources.
- iii.) Workload management or task scheduling based techniques.[12]
- iv.) Thermal-aware or thermal-management techniques which take into account the thermal properties .Further, some techniques address the issues related to cooling in data centers.

Data center managers are faced with planning for the future and the mandate to change their current rate of spending on equipment and operations. One area of focus has been the massive energy consumption of data centers and the impact of storage.[2]

These techniques can be classified at different levels:

- i.) Hardware and Firmware Level
- ii.) Operating System Level
- iii.) Virtualization Level
- iv.) Data Center Level [2]



Figure1: Power Management Techniques in Green Computing[2]

4. STEPS OF GREEN COMPUTING

As of Oct. 20, there are new performance requirements to qualify for the Energy Star rating for desktop and notebook computers, workstations, integrated computers, desktop-derived servers and game consoles. These specifications go into effect on July 20. But businesses don't have to wait until then to initiate more environmentally-friendly computing practices.

Here are five first steps you can take toward a green computing strategy. [6]

- I. **Develop a sustainable green computing plan:** Discuss with your business leaders the elements that should be factored into such a plan, including organizational policies and checklists. Such a plan should include recycling policies, recommendations for disposal of used equipment, government guidelines and recommendations for purchasing green computer equipment. Green computing best practices and policies should cover power usage, reduction of paper consumption, as well as recommendations for new equipment and recycling old machines. Organizational policies should include communication and implementation.[6]
- II. **Recycle:** Discard used or unwanted electronic equipment in a convenient and environmentally responsible manner. Computers have toxin metals and pollutants that can emit harmful emissions into the environment. Never discard computers in a landfill. Recycle them instead through manufacturer programs[6]
- III. **Make environmentally sound purchase decisions:** Purchase Electronic Product Environmental Assessment Tool registered products. EPEAT is a procurement tool promoted by the nonprofit Green Electronics Council to:
 - Help institutional purchasers evaluate, compare and select desktop computers, notebooks and monitors based on environmental attributes
 - Provide a clear, consistent set of performance criteria for the design of products
 - Recognize manufacturer efforts to reduce the environmental impact of products by reducing or eliminating environmentally sensitive materials, designing for longevity and reducing packaging materials All EPEAT-registered products must meet minimum requirements in eight areas of environmental impact and be energy efficient to reduce emissions of climate-changing greenhouse gases. To demonstrate corporate social and environmental performance, manufacturers must offer safe end-of-life management and recycling options when products become unusable

- IV. **Reduce Paper Consumption:** There are many easy, obvious ways to reduce paper consumption: e-mail, electronic archiving, use the “track changes” feature in electronic documents, rather than redline corrections on paper. When you do print out documents, make sure to use both sides of the paper, recycle regularly, use smaller fonts and margins, and selectively print required pages.
- V. **Conserve energy.** Turn off your computer when you know you won't use it for an extended period of time. Turn on power management features during shorter periods of inactivity. Power management allows monitors and computers to enter low-power states when sitting idle. By simply hitting the keyboard or moving the mouse, the computer or monitors awakens from its low power sleep mode in seconds. Power management tactics can save energy and help protect the environment.

4.1 Role of Green Computing in Cloud

Clouds play the role of a virtualized datacenters and the applications provided are the services offered by the cloud providers.[7] These services required high amount of energy for their execution. A typical datacenter with 1000 racks need 10 Megawatt of power to operate which results in higher operational cost. It means that for a data center energy cost is the crucial component. Green computing refers to environmentally sustainable computing. It minimize the use of electricity as well as energy and reduce the environmental dissipate when we are using a computer. The green computing has the same goals with green chemistry, which is longer the life time of the product and makes the product more efficiency of energy, advance the discarded product and factory waste to be more easily recycled and biodegradable, use of the less-hazardous materials. [1] Thus, energy consumption and carbon emission by Cloud infrastructures has become a key environmental concern. By implementing the technologies such as resource virtualization and workload consolidation, the datacenters can become much more energy efficient.

5. APPROACHES OF GREEN COMPUTING

Computer virtualization refers to the abstraction of computer resources. With virtualization, a system administrator could combine several physical systems into virtual machines on one single, powerful system, thereby unplugging the original hardware and reducing power and cooling consumption. Several commercial companies and open-source projects now offer software packages to enable a transition to virtual computing. Intel Corporation and AMD have also built proprietary virtualization enhancements to the x86 instruction set into each of their CPU product lines, in order to facilitate virtualized computing.

- i.) **Terminal Servers:** Terminal servers have also been used in green computing methods. Terminal Services for Windows and the Aqua Connect Terminal Server for Mac, both deliver operating systems to end users. Using this method user's terminal in to a central server. All of the computing is done at the server level but the end user experiences the operating system. There has been an increase in using terminal services with thin clients to create virtual labs. Thin clients use up to 1/8 the amount of energy of a

normal workstation. Using thin clients with a terminal server delivers the Windows or Mac operating system to end users while also decreasing energy costs and consumption. [9]

- ii.) **Power Management:** The Advanced Configuration and Power Interface (ACPI), an open industry standard, allows an operating system to directly control the power saving aspects of its underlying hardware. This allows a system to automatically turn off components such as monitors and hard drives after set periods of inactivity. In addition, a system may hibernate, where most components (including the CPU and the system RAM) are turned off. ACPI is a successor to an earlier Intel Microsoft standard called Advanced Power Management, which allows a computer's BIOS to control power management functions.
- iii.) **Power Supply:** Desktop computer power supplies (PSUs) are generally 70–75% efficient, dissipating the remaining energy as heat. An industry initiative called 80 PLUS certifies PSUs that are at least 80% efficient; typically these models are drop-in replacements for older, less efficient PSUs of the same form factor. As of July 20, 2007, all new Energy Star 4.0-certified desktop PSUs must be at least 80% efficient.
- iv.) **Storage:** Smaller form factor (e.g. 2.5 inch) hard disk drives often consume less power per gigabyte than physically larger drives. Unlike hard disk drives, solid-state drives store data in flash memory or DRAM. With no moving parts, power consumption may be reduced somewhat for low capacity flash based devices. Even at modest sizes, DRAM based SSDs may use more power than hard disks, (e.g., 4GB i-RAM uses more power and space than laptop drives). Flash based drives are generally slower for writing than hard disks [10]. As hard drive prices have fallen, storage farms have tended to increase in capacity to make more data available online. This includes archival and backup data that would formerly have been saved on tape or other offline storage. The increase in online storage has increased power consumption. Reducing the power consumed by large storage arrays, while still providing the benefits of online storage, is a subject of ongoing research.
- v.) **Video Card:** A fast GPU may be the largest power consumer in a computer. Energy efficient display options include: No video card - use a shared terminal, shared thin client, or desktop sharing software if display required. Use motherboard video output - typically low 3D performance and low power. Reuse an older video card that uses little power; many do not require heat sinks or fans. Select a GPU based on average wattage or performance per watt.
- vi.) **Display:** LCD monitors typically use a cold-cathode fluorescent bulb to provide light for the display. Some newer displays use an array of light-emitting diodes (LEDs) in place of the fluorescent bulb, which reduces the amount of electricity used by the display.
- vii.) **Telecommuting:** Teleconferencing technologies are often implemented in green computing initiatives. The advantages are many; increased worker satisfaction, reduction of greenhouse gas emissions related to travel, and increased profit margins as

a result of lower overhead costs for office space, heat, lighting, etc. The savings are significant; the average annual energy consumption for U.S. office buildings is over 23 kilowatt hours per square foot, with heat, air conditioning and lighting accounting for 70% of all energy consumed. Other related initiatives, such as hoteling, reduce the square footage per employee as workers reserve space only when they need it. Many types of jobs -- sales, consulting, and field service -- integrate well with this technique.[12]

6. RESEARCH CHALLENGES IN GREEN COMPUTING

[7] Energy is one of the most valuable and scarce resources available to humanity, a significant portion of which is now being consumed to power up computers and their accessories. In particular, high performance parallel and distributed computing systems, including data centers, supercomputers, clusters, real-time systems, embedded architectures, and grids not only consume considerable amounts of power but also require extensive air-conditioning. The explosive growth in computing is leading to rapidly increasing consumption of precious natural resources such as oil and coal, strengthening the looming danger of an energy shortage. The conversion of these resources to electricity results in carbon emissions that can negatively affect the environment, a threat that is continually escalating. However, energy saving usually comes at the expense of performance. Power-aware "green" computing requires a comprehensive and multi-disciplinary approach that involves myriad research challenges. In this talk, we give an overview of various research challenges encountered in green or energy-efficient computing. We also present our research activities pertaining to various aspect of energy and performance optimization in parallel and distributed computing environments. We propose multi-objective optimized scheduling algorithms and tools that can save energy while ensuring performance.[11]

7. CONCLUSION

Green computing is the environmentally responsible and eco-friendly use of computers and their resources. Power Consumption is the major issue in Data centers. We will improve this issue in our thesis work.

8. REFERENCES

- [1] Jin-tae Park, Hyun-seo Hwang:"Study and Analysis of an Efficient Power Consumption Application for Big Data Collection "Advanced Science and Technology Letters Vol.44 (Database 2013)
- [2] Amir Kavousian¹ and Ram Rajagopal:"A Method to Analyze Large Data Sets of power Consumption to Inform Data-Driven Energy Efficiency"CIFE Working Paper #WP130 June 2014.
- [3] Jay Squalli and Kenneth Wilson:"A Bounds Analysis of Power Consumption and Economic Growth in the GCC",Working Paper No. 06-09 June 2014
- [4] Runlin Zhou,Yingjie ,Shi Chungue and Zhu¹ Fan Liu:"AxPUE: Application Level Metrics for Power Usage Effectiveness in Data Centers", Industrial Technology (ICIT), 2015 IEEE International Conference, page 1765-17712015.

- [5] Argo Rosin, Taavi Möller, Madis Lehtla, Hardi Hõimoja: "Analysis of Power consumption patterns and economy of water heating shifting and saving bulbs" Authors thank Estonian Ministry of Education and Research (Tallinn University of Technology Grant No BF123, BF124, B613A).
- [6] Gernot Heiser: "An Analysis of Power Consumption" NICTA, University of New South Wales and Open Kernel Labs, Working Paper No.06-05 Dec 2014.
- [7] Aaron Carroll: "Power Consumption Analysis of Energy-aware FTTH Networks", ICDT 2015 : The Tenth International Conference on Digital Telecommunications
- [8] Kun Wang, Anders Gavler, Manxing Du, Christina: "Issues in International Energy Consumption Analysis: Electricity Usage in India's Housing Sector " Independent Statistics & Analysis Nov 2014.
- [9] Henrique Pombeiro, André Pina and Carlos Silva: "On the Performance and Energy Efficiency of Hadoop Deployment Models" HAL Id: hal-00856330 <https://hal.inria.fr/hal-00856330> Submitted on 8 Oct 2013.
- [10] Eugen Feller, Lavanya Ramakrishnan and Christine Morin: "Analyzing Residential Electricity Consumption Patterns Based on Consumer's Segmentation", Center for Innovation, Technology and Policy Research – IN+, Instituto Superior Técnico, Technical University of Lisbon, TagusPark Campus, Av. Professor Cavaco Silva, 2744-016 Porto Salvo, Portugal
- [11] David Chinarro and Jorge Gómez: "On the Energy (In)efficiency of Hadoop Clusters" Simplified Data Processing on Large Clusters. Commun. ACM, 2014.
- [12] Mandeep Kaur Saggi and Amandeep Singh Bhatia: "Minimum Power Consumption For Accelerating Map-Reduce

Orientation Effect In Natural Convection On Square Pin Fin Heat Sink

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Abstract

Experiment is carried out on natural convection heat transfer from square pin fin heat sinks subject to the influence of orientation. Total eight square pin fin heat sinks with numerous arrangements are tested beneath natural convection. A configuration of in-line square pin-fin heat sink situated in a rectangular channel with fixed diameter of pin fin of 5 mm and height which varies from 20mm – 50mm with spacing of 5mm and 7.5mm. Previous investigators results indicate that the downward facing orientation gives lowest heat transfer coefficient. So this study is restricted just for upward to sideward facing orientation with different angles from zero, 30, 45, 60, 90 degree. When we changes orientation from upward to sideward results are showing variation in temperature, heat transfer coefficient etc. Depending on the fin structure, the performance of those two orientations shows a competitive nature. It's found that the upward facing arrangement of warmth sink provides higher result than that of sideward facing for given heat sinks. Experimental results conjointly show that as angle of inclination will increase temperature difference also increase.

1. INTRODUCTION

Now-a-day's residual heat is generated in measure amount of engineering instrument required to be dissipated to atmosphere. If the warmth heat isn't removed then the

instrument tends to fail attributable to heating. Throughout the conversion of one type of energy into the other type of energy losses of energy takes place. The measurable amount of energy is lost in the form of thermal energy i.e. heat. Heat is transient type of energy. Heat transfer is vital parameter for the proper & efficient working of the all the mechanical as well as electronics components. Engines, condensers, transformers, etc. possesses great deal residual heat generated throughout the operating of those equipments. This heat generated causes development of stresses within the parts & shortens the lifetime of the parts. Hence, there is need of increasing the rate of heat transfer from the main body to the atmosphere.

Now consider the heat transfer equation, this offers the speed of heat transfer from any surface while not having fin configuration.

$$Q_{\text{conv}} = h A_s \Delta T \quad \dots 01$$

From this formula we can extract few ways to increase the heat transfer and those are increase the convection heat transfer coefficient h , increase the surface area A_s , increase the temperature difference. But, increasing h may require the installation of additional setup like pump or fan or replacing the existing one with a larger one. For natural convection processes it's uphill to extend the convective heat transfer coefficient. For the given conditions the temperature difference remains constant. The remaining alternative way is to extend the area by attaching extended surfaces. Hence, heat transfer within flow passages is increased by victimisation passive surface modifications like rib tabulators, protrusions, pin fins and dimples. In most of the cases fins are used to enhance or to increase the heat transfer rate. In this, particular extended surfaces pin fin is well known geometry due to large surface area with less volume compare to other varieties of fins. A recent elaborate discussion on analysis and style of finned array heat sinks was conferred by Kraus and Bar-Cohen. Whereas good amount of info exists on plate fins, comparatively less info on natural convection in pin-fin arrays is offered. Sparrow and Vemuri through an experiment investigated natural convection and radiation heat transfer from arrays of pin fins with density within the vary 0.31–1.33 pins/cm². The quantitative relation of fin diameter to lateral fin spacing was found to play a major role and its optimum price was found to be near 0.5. The orientation effects of pin fins were conjointly investigated and located to alter the heat transfer by 15– 200. Radiation was found to be a vital issue, causative 25–45% of the heat transfer. Zografos and Sunderland according on experimental and numerical studies on natural convection heat transfer from pin-fin arrays. They found associate degree optimum quantitative relation of 0.333 for a 203 X 203 sq. array of pin fins. In distinction to Sparrow and Vemuri , they found that the orientation of pin-fin arrays had a really restricted result on the heat transfer. Aihara performed an in depth experimental investigation of natural convection and radiation heat transfer from pin-fin arrays with a vertical base plate. Totally, fifty nine varieties of circular pin-fin dissipaters were used. They utilized a symmetrical pure mathematics a

couple of common base to attenuate the heat loss from the bottom plate. Temperature measurements and flow visualizations were conducted and an empirical expression for the typical average heat transfer constant was derived. Kobus and Oshio investigated the result of thermal radiation on the heat transfer of pin fin heat sinks and offered an overall heat transfer coefficient that was the total of an efficient radiation and a convective heat transfer coefficient. Fisher and Torrance conferred the analytical solutions relevant to the bounds of free convection for pin fin cooling. They instructed that the design of pin fin sink can be optimized by properly selecting the pin fin diameter and also the heat sink porosity. For conventional heat sinks, the minimum thermal resistance was regarding two times bigger than that in a ideal limit in line with the model of inviscid flow with idealised native heat transfer.

Although several previous researches were created towards the understanding of natural convection from spherical or circular pin fin arrays, nearly no experimental knowledge is available for the pin fins having rectangular or square configuration that is additionally a really common fin configuration utilized in electronic cooling applications. Above all, few researches have expressly explicitly demonstrated the subtle difference of orientation result on the pin fin performance that is of sensible importance for relevant applications. For this reason, the primary objective of this study is to provide experimental data for square pin fin heat sinks with natural convection. Secondly, the dependence of the pin fin performance on the orientation effect is presented in a additional elaborate manner.

2. EXPERIMENTAL SETUP

In this study, a scientific approach is adopted to review the natural convection heat transfer of rectangular pin fin with totally different parameters. The main target of this study is on developing compact simple to use thermal models which will predict the natural convective heat transfer of sq. pin fin, rectangular walls to the close. The new experimental workplace has been designed and engineered to verify the developed models. Experimental studies with numerous testing samples at totally different scales were performed. The planning parameters embody the heat sink material, the quantity and geometry of the fins. So as to get the minimum thermal resistance, number of the fins, fin shapes parameters should be designed well. Aerated concrete block is mounted on the frame that ensures one dimensional cooling. The front surface of the frame has removable acrylic sheet thus on replace fin arrays. Heater plate is placed on the concrete block. Base thickness of the array is 7.5mm thus on distribute power offer uniformly. Heater lined by cases totally consists of nichromes wire wound around skinny translucent substance plate and translucent substance sheet. Heater plate rated for 180W and 230V, AC. The take a look at section was unbroken insulated and controlled space to determine free convection over fin arrays. The aerated concrete block has 3mm depth to suit heater plate into it. This facilitates to insulate rear surface of heater and 4 lateral surfaces of heater. Extruded surface is unbroken over fin array for fitting to aerated concrete block to reduce the air gap between heater plate and fin array clamping arrangement is formed. Aerated concrete

block has high insulation quality and heat resistance (thermal conduction, $k \sim 0.15$ W/mK). A brand new testbed has been designed for mensuration natural convection heat transfer from the pin finned heat sinks. The testbed embody a heater which is able to attach to the backside of the fins base-plate, and a knowledge acquisition system.



Figure 2: Experimental Setup

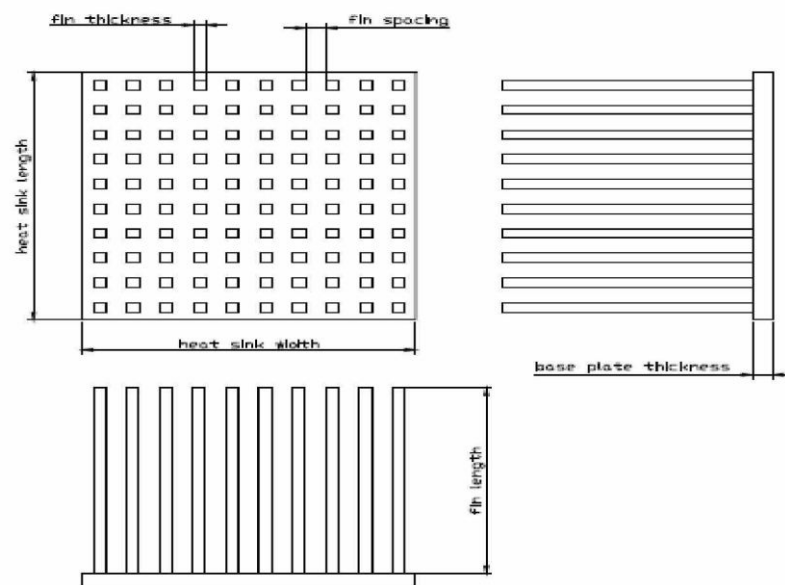


Figure 3: Heat Sink Design Parameters

Table 1: Dimension of Setup

Sr. No.	Component	Dimension (mm)
1	Frame	700X700X350
2	Heater	100X100X3
3	Concrete	170X170X100
4	Heat Sink Base	100X100

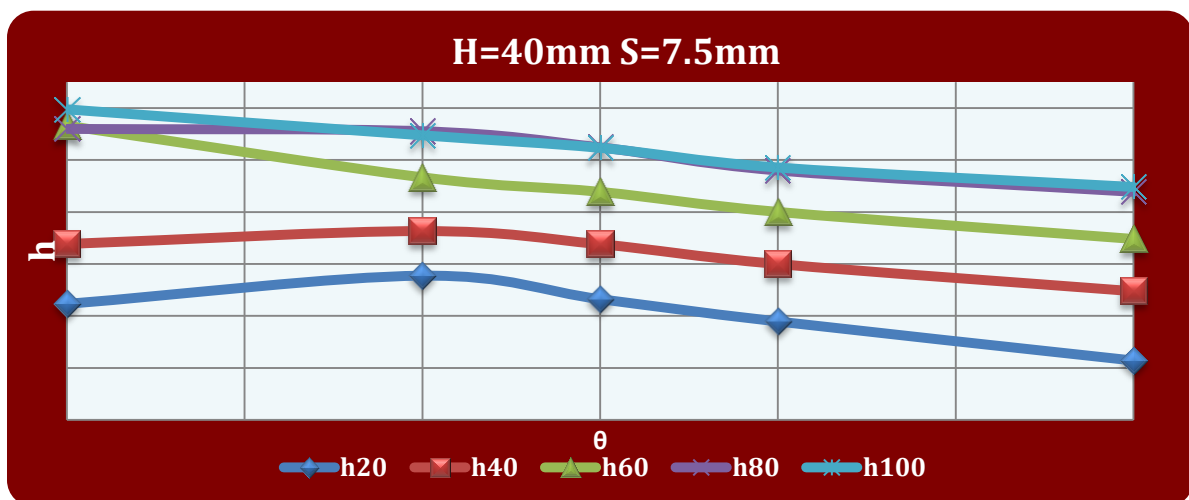
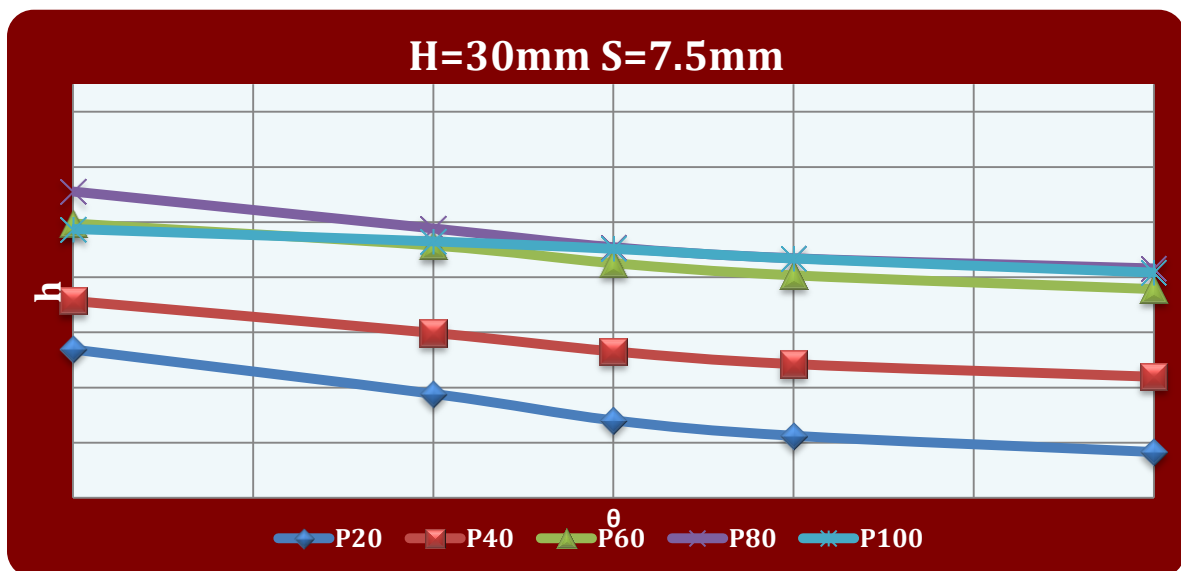
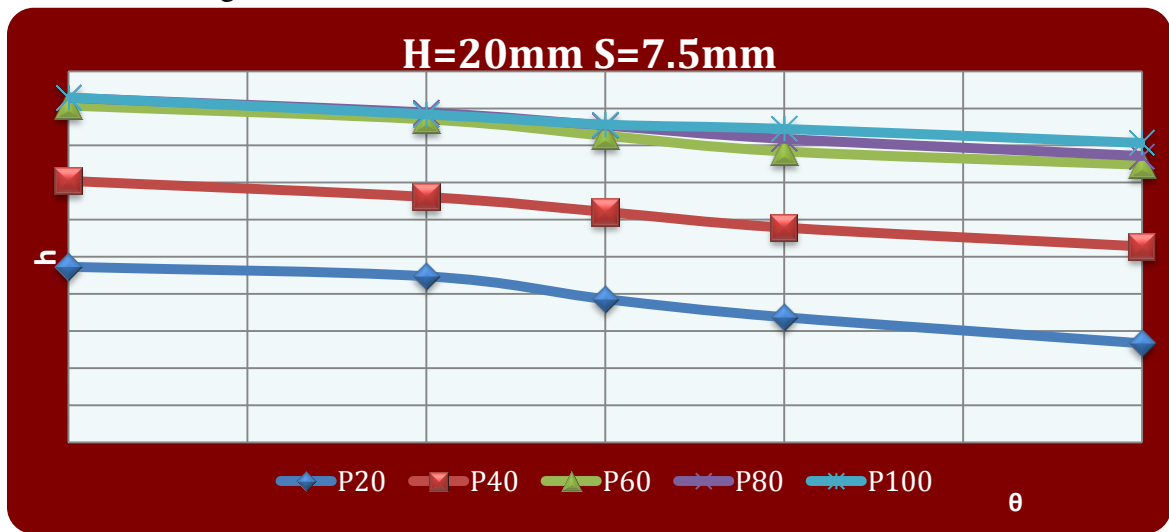
During the experiments, the input power of 20W, 40W, 60W, 80W, 100W is provided to the heater and surface temperatures are going to be measured at numerous locations at the rear of the bottom plate. Electric power is applied victimization the AC power supply. The voltage and also the current is measured with meter and meter to see the facility input to the heater. Thermocouples are installed in numerous locations on the surface of the enclosures. All thermocouples are taped down to the inside surface of the enclosure, to prevent disturbing the buoyancy driven air flow in front of the fins. An additional to this one thermocouple is used to measure the ambient room temperature during the experiments. Thermocouples square measure blocked into the DAS. Temperature measurements performed at five points so as to watch the temperature variation on the tested heat sinks. The average of these five readings is taken as the base plate temperature. For every heat sink, the procedure is continual for various power inputs of 20W, 40W, 60W, 80W, 100W. The base-plate temperature, the ambient temperature, and the power input to the heater considering that the power factor equals to 1 is recorded at steady state condition. . The steady state is considered after 120 minutes elapsed from the start of the experiment and the rate of temperature variations with respect to time for all the thermocouples were less than 10/hour. Within the present study, numerous heat input from 20W-100W is given for total eight range of heat sink with numerous height and spacing. Same experimental procedure which is detailed above is carried out numerous times for different angle like 30, 45, 60, 90 degree from upward to sideward facing orientation to find effect of orientation on various performance parameters.

4. RESULT AND DISCUSSION

The experimental data obtained from total 8 different square pin fin configurations are presented in this chapter. These all results are useful to reveal the effect of said geometric parameters, aspect ratio of heat sink and heat input on the steady state heat dissipation from finned surfaces. The convection heat transfer coefficient from pin fin arrays are plotted as a function of angle of inclination for fin height, $H=20, 30, 40, 50$ mm and fin spacing, $S=7.5$ mm and 5mm, respectively.

4.1 Variation of convective heat transfer Variation of heat transfer coefficient with angle of inclination. As observed through Figure 4 and 5, the convection heat transfer coefficient from pin fin arrays depends on angle of inclination provided to heat sink. Various graphs are plotted to investigate heat transfer coefficient at different orientation for various spacing and heights respectively. After plotting graph, it is found that Convective heat transfer coefficient decreases as angle of inclination increases as shown in fig.4 and 5.

Also, effect of fin height and spacing on convection heat transfer coefficient can be observed from figure.



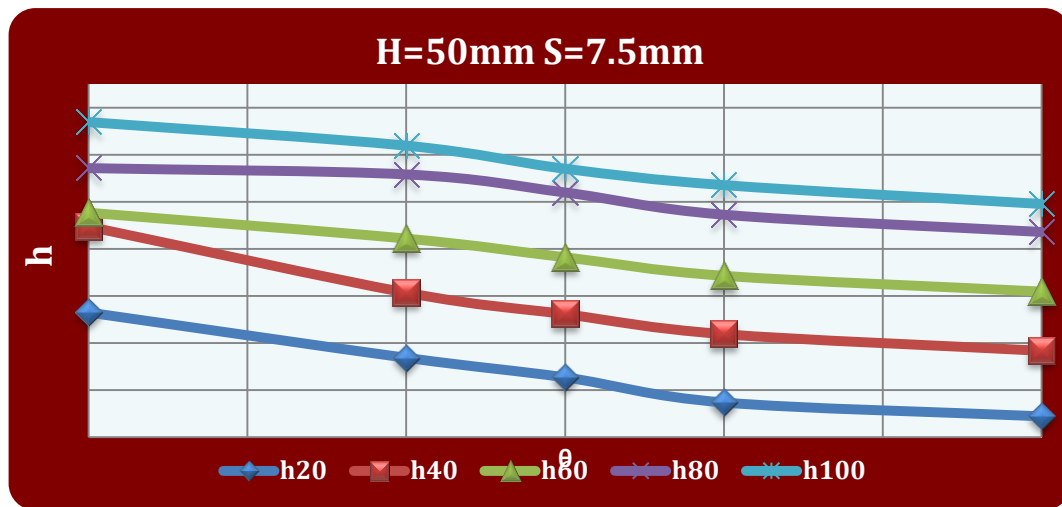
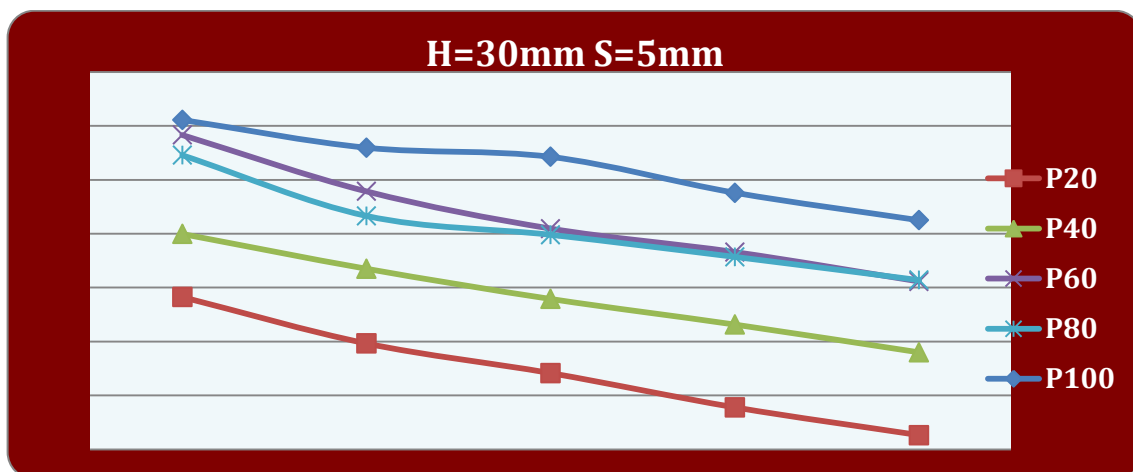
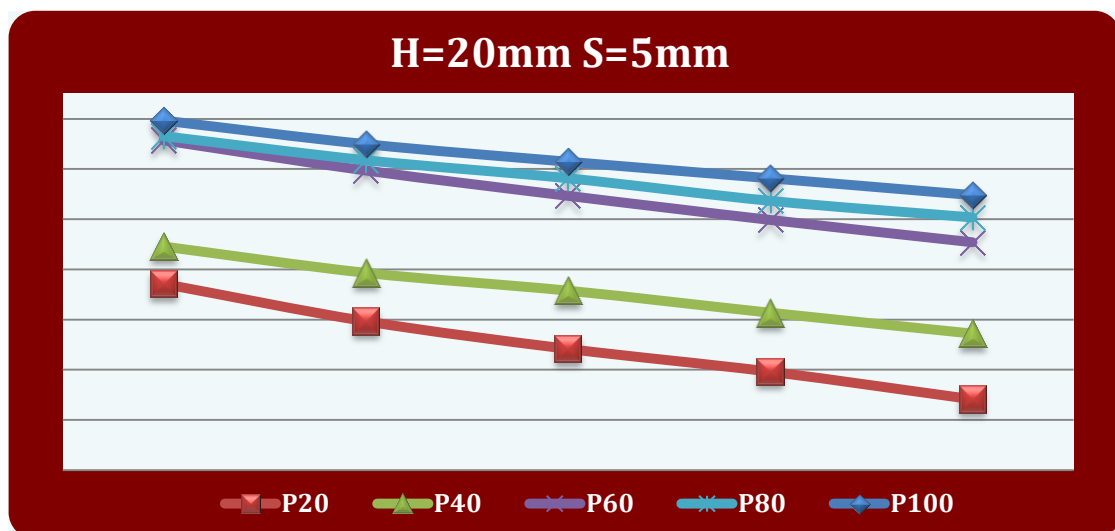


Fig.4 Variation of heat transfer coefficient with angle of inclination for spacing=7.5mm, fin height H=20mm,30mm,40mm,50mm and heat input Q_{in} =20W, 40W, 60W, 80W, 100W



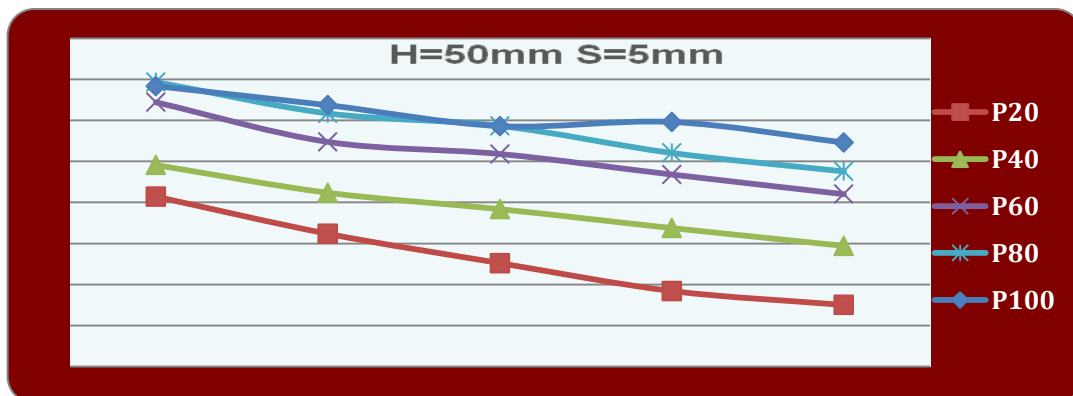
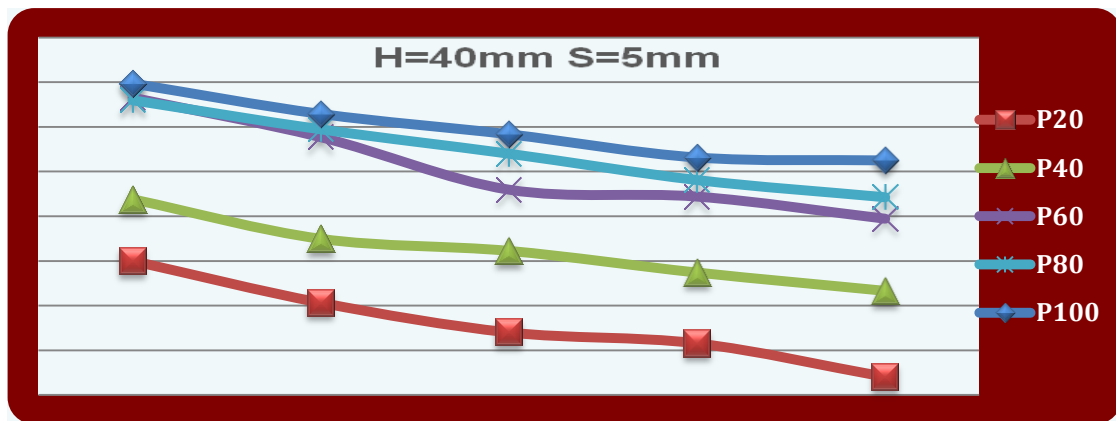


Fig.5 Variation of heat transfer coefficient with angle of inclination for spacing=5mm, fin height H=20mm,30mm,40mm,50mm and heat input Q_{in} =20W, 40W, 60W, 80W, 100W

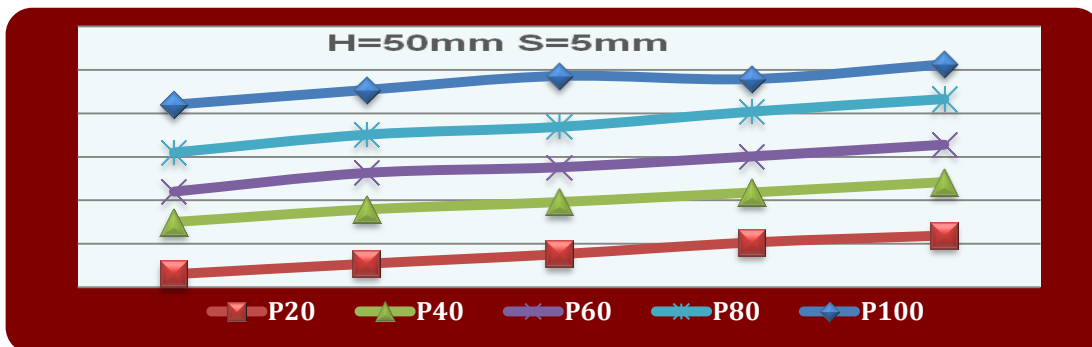
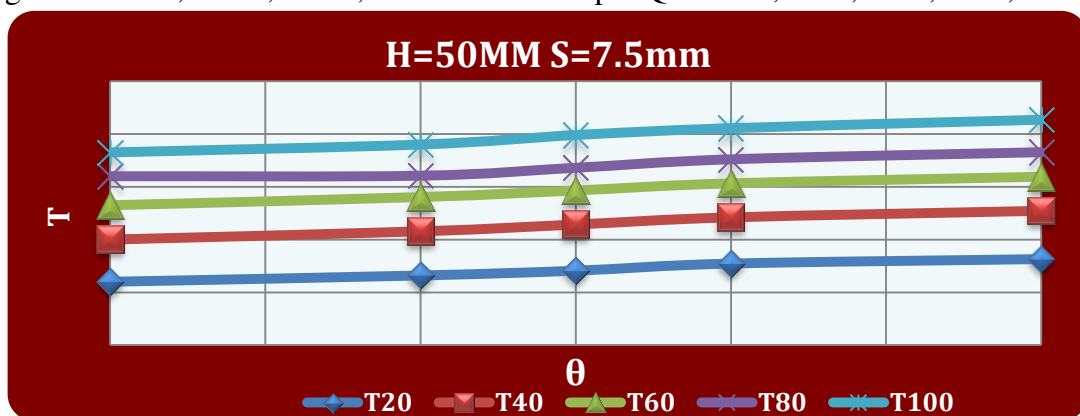


Fig.6 Variation of temperature difference with angle of inclination for spacing=5mm and 7.5mm for heat input $Q_{in}=20W, 40W, 60W, 80W, 100W$ for height 50mm.

Figure 6 shows variation of temperature difference with angle of inclination for spacing=5mm and 7.5mm for height 50mm. From graph, it is clearly shows as angle of inclination of heat sink increases temperature difference also increases. Same trends of graph observed for remaining heights also. Therefore, we can conclude that angle of inclination plays an important role on convective heat transfer coefficient and temperature difference.

5. CONCLUSION

Experiment is carried out on natural convection heat transfer from square pin fin heat sinks subject to the influence of orientation. Total eight square pin fin heat sinks with numerous arrangements are tested beneath natural convection. A configuration of in-line square pin-fin heat sink situated in a rectangular channel with fixed diameter of pin fin of 5 mm and height which varies from 20mm – 50mm with spacing of 5mm and 7.5mm. From experimental results we can conclude that angle of inclination or orientation directly effects on heat transfer performance of pin fin heat sink. Heat transfer coefficient decreases with increase in angle of inclination. Also, as angle of inclination increases temperature difference between surface temperatures to ambient temperature also increases for same power or heat input. Finally, it is concluded that upward facing orientation gives better heat transfer rate than sideward facing orientation due to restriction in proper flow movement.

6. REFERENCES

- [1] A.D. Kraus, A. Bar-Cohen, Design and Analysis of Heat Sinks, John Wiley & Sons, New York, 1995.
- [2] J Wei, K. Hijikata, T. Tomimura, M. Fujii, Numerical study on natural air cooling of fin arrays with enclosed boundaries, in: Advances in Electronic Packaging EEP-vol. 19-2, 1997,pp. 2107–2114.
- [3] E.M. Sparrow, S.B. Vemuri, Natural convection/radiation heat transfer from highly populated pin–fin arrays, J. Heat Transfer 107 (1985) 190–197.
- [4] E.M. Sparrow, S.B. Vemuri, Orientation effects on natural convection/radiation pin–fin arrays, Int. J. Heat Mass Transfer 29 (1986) 359–368.
- [5] A.I. Zografos, J.E. Sunderland, Natural convection from pin fins, Exp. Thermal Fluid Sci. 3 (1990) 440–449.
- [6] A.I. Zografos, J.E. Sunderland, Numerical simulation of natural convection from pin–fin arrays, ASME HTD 157 (1990) 55–66.
- [7] T. Aihara, S. Maruyama, S. Kobayakawa, Free convective/ radiative heat transfer from pin–fin arrays with a vertical base plate (general representation of heat transfer performance), Int. J. Heat Mass Transfer 33 (6) (1990) 1223–1232.
- [8] C.J. Kobus, T. Oshio, Predicting the thermal performance characteristics of staggered vertical pin fin array heat sinks under combined mode radiation and mixed convection with impinging flow, Int. J.Heat Mass Transfer 48 (13) (2005) 2684–2696.
- [9] T.S. Fisher, K.E. Torrance, Free convection limits for pin-fin cooling, J. Heat Transfer 120 (3) (1998) 633–640.

An Experimental Investigation On Stabilizing The Soil Using Rice Husk Ash With Lime As Admixture

Paper ID	IJIFR/V3/ E9/ 068	Page No.	3511-3519	Subject Area	Civil Engineering
Key Words	Black Cotton Soil, RHA, Lime, OMC, California Bearing Ratio, Unconfined Compressive Strength				

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Abstract

In India, one-fifth of our land area is covered by black cotton soil which is also known as expansive soil. These soils are mostly found in arid and semi-arid regions. These soils are found to be highly problematic in constructional activities. It causes severe damages to the structure because of its alternate swelling and shrinkage nature. This happens due to alternate drying and wetting of soil. To avoid these circumstances, soil must be stabilized and strength is to be increased. Soil can be modified or improved by many methods which include mechanical methods, use of chemicals or wastes as stabilizing agent etc. From the above said methods, improvement to soil by using waste material is beneficial and effective one. In our country, wastes are generated from various ways. It includes domestic wastes, industrial wastes, agricultural wastes etc. It is very difficult to dispose these wastes without affecting the environment and its surroundings. To overcome these problems, it can be used as a stabilizing agent in the soil. By using the wastes as stabilizing agent, it not only increases the strength of soil but also paves way in reducing the construction cost, easy way for waste disposal and turns the environment to be eco-friendly. This paper presents about an experimental study carried out to find the effect of Rice Husk Ash (RHA) which is an agricultural waste on index and engineering properties of the expansive soil. The properties such as compaction, California bearing ratio, unconfined compressive strength is determined with partial replacement

of RHA in black cotton soil at various percentages(2.5%, 5% etc) in addition of lime in small amount to it at a constant rate of 2%. On the results achieved, it gives a conclusion that the Optimum moisture content (OMC) increases with the addition of RHA in soil. The California Bearing ratio is also having a tremendous increase in strength with soil mixed with RHA and the optimum percentage of RHA with soil is found to be 5% and RHA with lime and soil is found to be 10% effectively. Thus a promising and improving result is obtained in stabilizing the soil with Rice Husk Ash in both cost and strength evaluation.

1. INTRODUCTION

1.1 Black Cotton Soil

Expansive soil which is also called as black cotton soil is very difficult to be used in construction. This is due to hot climate and poor drainage conditions associated with these soil formations. These soils inhibit the moisture from the surface in monsoon and summer season by means of evaporation. Owing to these reasons, the soil possess cyclic swell-shrink behavior, low strength, high moisture content, volume change in soil, differential settlement etc. These failures may result in longitudinal and transverse cracking of pavements, surface distress, rutting of surface and deep cutting in foundations. To overcome these circumstances in the soil, it should be treated and stabilized in best way.

1.2 Stabilization

Stabilization is mostly used in variety of engineering works, where it is main objective is to increase the strength and improve the durability and stability of the soil in a cost effective way. Soil stabilization is the application or treatment of soil by mechanical methods or addition of modifier (cement, lime, bitumen etc.,) or combination of both to improve the strength of the soil. Expansive soil can also be stabilized by using waste materials. The usage of waste material in stabilization has been introduced due to sharp increase in price of stabilizing materials like cement, lime etc and increase in construction cost. To avoid these problems, wastes generated from the industries, agricultural areas can be used to stabilize the soil. It will give a best solution and alternative way to dispose the wastes and clear the environment surroundings in a beneficial manner.

1.3 Rice Husk Ash (RHA)

Rice Husk Ash (RHA) is one of the agricultural waste produced in our country when the rice is milled from paddy. About 108 tonnes of rice husk is produced in our world annually. Rice husk consists of about 67-90% of silica. The silica is present in this rice husk in amorphous form and it is considered to be a pozzolanic material. It has been estimated that 1000 kg of rice produce 200 kg of rice husk from which 40 kg of rice husk ash would be generated. The rice husk ash is obtained by burning the rice husk in a kiln at a temperature of about 6000°C for 24 hours. Since the silica is present in amorphous form, it reacts with CaOH and liberates the heat and forms the cementitious

compounds. Rice Husk is shown in Figure 1 and the relevant Rice Husk Ash is shown in the following Figure 2.



Figure 1- Rice Husk



Figure 2- Rice Husk Ash

1.4 Lime

In this study, lime is used as binding material in small amount to increase the strength of the soil satisfactorily. Lime is nothing but Calcium oxide or Calcium hydroxide. When the lime reacts with the soil, there is exchange of cations in adsorbed water layer which results in decrease in plasticity of soil. The lime is more friable and it is more suitable to use in subgrade. In my project work, the lime is added at a constant rate with the soil mixed with RHA and the improvement in strength is evaluated.

1.5 Objective of Study

This experimental study focused on the effect of RHA and lime on index and geotechnical properties of the soil and its performance on the subgrade. Rice Husk Ash is added as partial replacement material with variation of percentage as 2.5%, 5%, 7.5%, 10% in steps of 2.5% and the lime is added as a binding material at constant percentage of 2% to enhance the strength and stability of the soil. The laboratory tests are carried out and the effect on soil properties such as Particle size distribution, Atterberg limits, field density, optimum moisture content, Maximum dry density, California Bearing ratio, Unconfined compressive strength is determined in both natural soil and soil mixed with RHA and soil mixed with RHA and lime. From the above experimental investigations, optimum value of percentage addition of RHA with black cotton soil is evaluated and suggest to pave way for the construction of pavement subgrade.

2. MATERIALS USED

2.1 Black Cotton Soil Sample

For the experimental work, the soil sample is collected from the canal banks of Kalingarayan Channel in Karungalpalayam village in Erode District, Tamilnadu. About 100 kg of sample is collected and brought to the soil mechanics laboratory in our college for the project work. Standard test on the soil is carried out in our laboratory with the collected soil sample and properties of the soil are determined. The property of the soil is tabulated in Table 1.

Table 1- Properties of Black Cotton Soil

Soil Properties	Test Results
Specific gravity	2.51
Liquid Limit (%)	47.95
Plastic Limit (%)	23.94
Plasticity Index (%)	24.01
Shrinkage Limit (%)	16.11
Free Swell Index (%)	23.56
IS Classification	CH (High Plasticity)
Grain Size analysis-Percent passing 75 μ sieve	89%
Optimum Moisture Content (%)	12
Maximum Dry Density (g/cc)	1.03
Insitu Soil Density (g/cc)	1.59
California Bearing Ratio (%)	2.05
Unconfined Compressive Strength (KN/m ²)	73

2.2 Rice Husk Ash

Rice husk is obtained from milling of rice. The material contains silica in huge amount which also refers to be a good pozzolanic material. Being a pozzolana, it reacts with soil in stabilizing process and makes it provide long life durable subgrade in roads. For the project work, the rice husk sample is obtained from the agricultural areas near Pallipalayam Village, Kombanaipudhur in Erode District, Tamilnadu. The samples are collected in three gunny bags. It is then sieved to remove the vegetative and dust particles and then burnt at high temperature to get powdered ash. Then it is cooled for about three hours and taken to the laboratory for determining its chemical composition. The Chemical composition of rice husk ash (RHA) is tabulated in Table 2

Table 2-Chemical Composition of RHA

Chemical Parameters	Composition Value (%)
Silica	90.80
Aluminum	3.50
Ferric Oxide	1.32
Calcium Oxide	1.57
Magnesium Oxide	1.20
Sodium	0.15
Potassium	0.24
Loss on ignition	0.67

Also the geotechnical properties of the soil are found out. Since the rice husk ash is to be added in partial replacement material in soil to improve its strength, it must also have the similar properties as like the soil sample. Therefore RHA sample is observed in the soil mechanics laboratory and its geotechnical properties is tabulated in Table 3.

Table 3-Geotechnical Properties of RHA

Properties	Test Results
Specific gravity	2.4
Liquid Limit (%)	49.4
Plastic Limit (%)	24.97
Plasticity Index (%)	24.43
Water Content (%)	30.16
Optimum Moisture Content (%)	14
Maximum Dry Density (g/cc)	1.51

2.3 Lime

Lime is used as a binding material in small amount in this research. It provides an economical way of stabilization being less susceptible to water content. For the work, lime is used in sludge form taken from a industry in Puliur village in Karur District, Tamilnadu. The Chemical composition of the lime is tabulated in Table 4.

Table 4: Chemical Composition of Lime

Chemical Parameters	Composition Value (%)
Calcium Oxide	90.80
Silica	3.50
Alumina	1.32
Iron Oxide	1.57
Magnesia	1.20
	0.15
	0.24
	0.67

3. METHODOLOGY

The soil sample and the perspective stabilizing sample is collected and sieved through 0.075mm aperture before use. Then its oxide composition is found out. And then, preliminary test are done on the soil sample and the stabilizing material to analyze the similarities in the geotechnical properties. The laboratory tests done to determine the properties include Particle size distribute on, Consistency Limits (Atterberg Limits), Insitu soil tests etc. The Standard Compaction test was done to find the optimum moisture content needed for the CBR test specimens.

In the second phase of work, the Rice Husk ash is added to the soil from 2.5% to 10% at an interval rate of 2.5% and lime is added at constant percentage rate of 2%. By this partial replacement being done in the soil, California Bearing Ratio (CBR) and Unconfined Compressive Strength (UCS) of the natural soil and soil mixed with RHA and soil mixed with RHA + lime is comparatively studied by this experimental work and result is analyzed for effective strength increment and reduction in construction cost and to provide green environment.

4. EXPERIMENTAL PROGRAM – RESULTS AND DISCUSSIONS

4.1 Compaction

The standard compaction test is done according to the procedures given in the relevant Indian Standard Codes. The test is done to determine the variation in optimum moisture content and maximum dry density in natural soil and RHA mixed soil with 2% of lime. The Dry density of soil sample increases with the increase in moisture content in natural soil to a certain limit and get decreased after reaching the maximum dry density value. When the RHA mixed soil is compacted, the maximum dry density decreases with increase in moisture content with increase in RHA content. The decrease in MDD explains that the RHA is a light weight material with low specific gravity and more voids. So it absorbs water more in the void space provided. Hence more water is added to compact RHA mixed soil. Therefore lime is added to decrease the water content and increase the MDD of the soil in a good way. The variations in MDD and OMC with the nature soil and RHA mixed soil is shown in Figure 3 and Figure 4 and Figure 5 respectively.

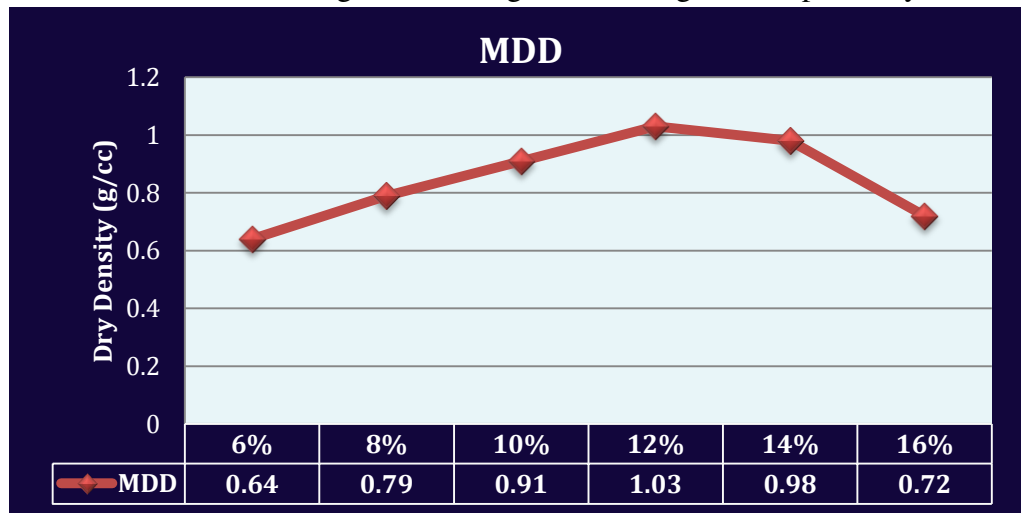


Figure 3-Variation of MDD in Black Cotton Soil sample

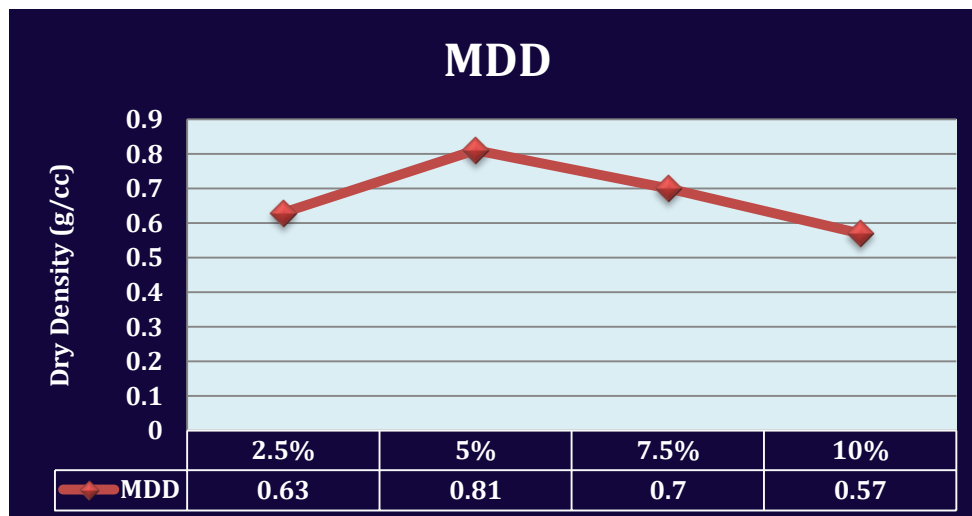


Figure 4- Variation of MDD in RHA mixed soil sample

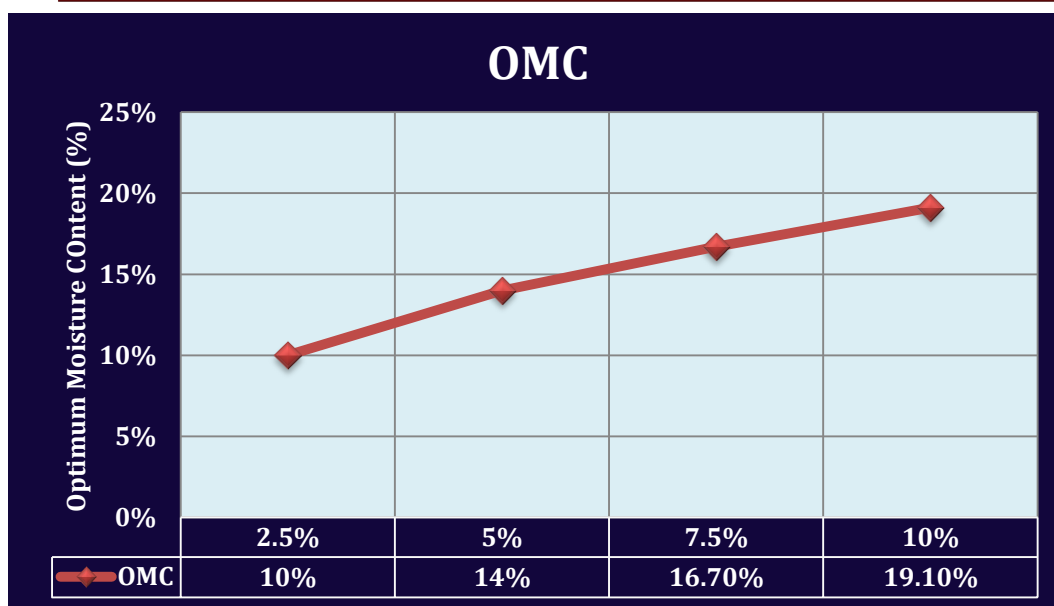


Figure 5- Variation of OMC in RHA mixed soil sample

4.2 California Bearing Ratio

This is also one of the common tests done to evaluate the strength of stabilized soils, This CBR value is widely used in the design of base course and sub base course in pavement construction. The variation of CBR with RHA content addition from 2.5% to 10 is shown in Figure 6. For the unsoaked soil samples, the value of CBR has slight increase with addition of 2.5% of RHA and raises more at 5% RHA. The value of CBR drops down at 7.5% and 10% of RHA. The decrease in CBR value is due to clay content reduction in soil. This results in reduction of cohesive force in the soil sample. Initially RHA with high silica content forms the cementitious compound giving the good cohesion. When the RHA content increases in the soil, it slows down the pozzolanic reaction by occupying the void spaces in the soil and reducing the bond between soil and RHA mixtures.

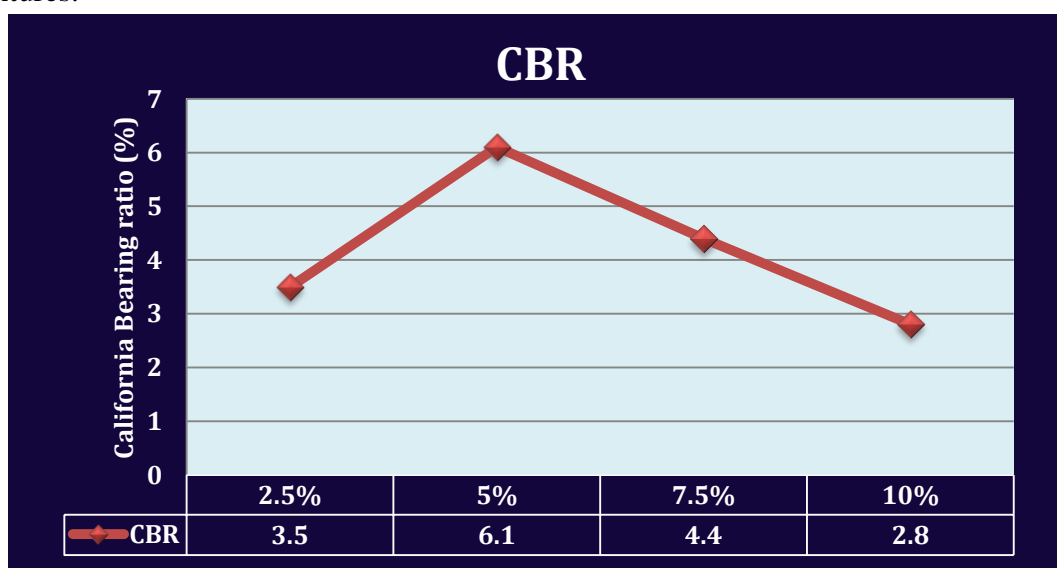


Figure 6-Variation of CBR in RHA mixed soil sample

4.3 Unconfined Compressive Strength

This method is also used to evaluate the strength of stabilized soils. This test is mostly recommended to find out the amount of stabilizing material required in soil stabilization. The variation of UCS of the soil stabilized with RHA-lime admixture is shown in Figure 7. The UCS value increased with increase in RHA content at percentage intervals from 2.5% to 10%. The UCS value of the natural black cotton soil was found to be 250 KN/m². With the addition of 2.5% of RHA, the UCS value increased to 269 KN/m². On Further addition of 5% of RHA to the soil, the UCS value increased to 286 KN/m². After that, the UCS value decreases with addition of RHA content in the soil. This is because of the similar reasons said above in the CBR test itself. On excess addition of RHA, the reaction between the CaOH in the soil and rice husk ash becomes slow which results in weak bonding between soil-RHA mixtures.

To improve the strength of soil and RHA admixture, addition of lime is considered. Lime is added at a constant rate of 2%. On reaction of lime with silica, it produce cementitious material and binds together with the soil. With the addition of lime to Soil-RHA mixture, UCS value gets increased to 350 KN/m². But the addition of lime more than 2% with RHA is not beneficial in strength increment.

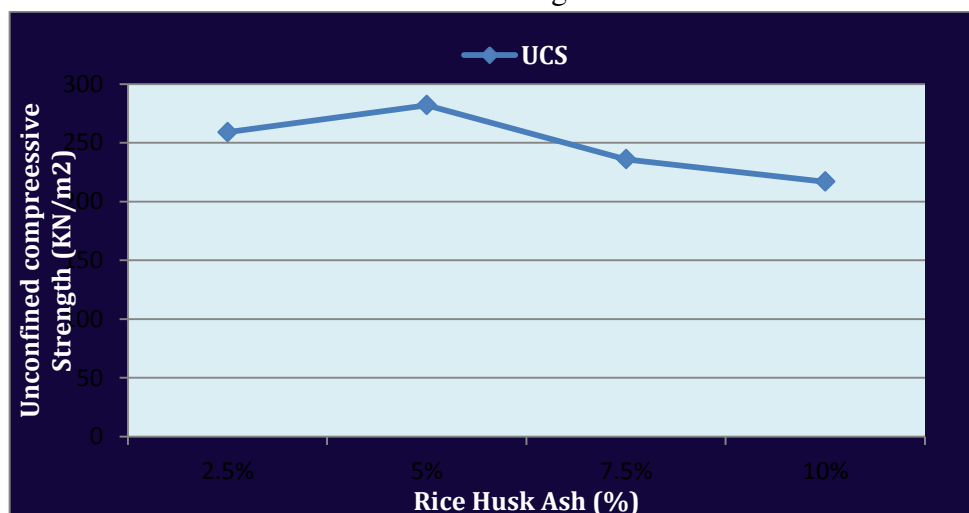


Figure 7- Variation of UCS in RHA mixed soil sample

5. CONCLUSION

In this experimental study, the effect of RHA on geotechnical properties of the expansive soil are investigated and analyzed. From the results obtained, it can be concluded there is little improvement in the usage of RHA stabilized soil. The conclusion to the study is summarized as follows:

The specific gravity of the soil decreases with the addition of RHA to the soil. The liquid limit and plastic limit of the soil increases with the percentage increase of RHA. It was also observed that the maximum dry density (MDD) of the soil decreases with the addition of RHA due to lower specific gravity of RHA. The optimum moisture content (OMC) of the soil increases on stabilizing with RHA due to pozzolanic reaction between CaOH of the soil and RHA. The shrinkage limit of the soil decreases with the increase of

RHA. The swelling nature of the soil decreases with the addition of RHA which reduces the formation of cracks on the pavement surface. The CBR and UCS value gets increased to high limit at an optimum value of 5% of RHA content and 2% of lime. It is also be concluded that for the improvement in strength using stabilization in practical purposes, these optimum percentage values of RHA and lime can be recommended for construction. But addition of lime and RHA beyond this limit to the soil is not beneficial and workable.

6. REFERENCES

- [1] Aparna Roy (2014), Soil Stabilization using rice husk ash and cement, "International Journal of Civil Engineering Research", ISSN 2778-3652, Vol 5 Number 1 pp 49-54.
- [2] Grytan Sarkar, Md.Rafiqul Islam, DR.Muhammed Alamgir, Interpretation of Rice Husk Ash on Geotechnical Properties of BC soil, "Global Journal of Researches in Engineering", Volume 12 Issue 2 February 2012.
- [3] B.Sunel Kumar, Preethi, Behaviour of expansive soil stabilized with rice huskash &lime, "International Journal of Engineering Trends and Technology", Vol 11 No.1, May 2014 pp 44-49.
- [4] J N Jha and K.s Gill (2006), Effect of rice husk ash on lime stabilization, "Journal of the Institution of Engineers (India)", Vol 87, Issue 28, pp 33-39.
- [5] IS 2720 (Part- 5,7,10), Indian Standard Methods of Tests for Soils.
- [6] S.M.Prasanna Kumar (2012), Silica and Calcium effects on Geo-tech Properties of Expansive soil extracted from Rice Husk Ash and Lime, "International Conference on Environment Science and Engineering", Vol 32 pp 119-123.
- [7] Air F Haji, A Adnan and Chew K C (1992), Geotechnical properties of a chemically stabilized soil from Malaysia with rice husk ash as an additive, Journal of Geotechnical and Geological Engineering, 10, No.2, pp. 117-134.
- [8] Agarwal, B. M. (1989). "Utilization of rice husk ash." Assumption University journal of Thailand, 12(2): 115-120
- [9] Akshaya Kumar Sabat, "Engineering Properties of an Expansive soil Stabilized with Rice husk ash and Lime sludge" International Journal of Engineering and Technology (IJET), Vol 5, No.6 Dec 2013-Jan 2014.

Analysis Of Monopole Telecommunication Tower

Paper ID	IJIFR/V3/ E9/ 069	Page No.	3520-3524	Subject Area	Civil Engineering
Key Words	Monopole Telecommunication Tower, Seismic, Wind ,Ice, Staad(X)Tower				

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Abstract

With the advance of mobile communication, nowadays, communication network requires telecommunication towers of considerable height to cover the large area of population. Among Monopole, Self-supporting and Guyed, the most commonly used are the self-supporting towers in the field of telecommunication. In this project an attempt is made to study a simple monopole tower, its analysis and design. Very popular software namely TNX and STAAD(X) TOWER are used for the analysis and design of monopole telecommunication towers. The usual structural analysis models for telecommunication and transmission steel tower design tend to assume a simple truss behavior where all the steel connections are considered hinged. Despite this fact, the most commonly used tower geometries possess structural mechanisms that could compromise the assumed structural behavior. A possible explanation for the structure stability is related to the connections semi-rigid response instead of the initially assumed pinned behavior. This work proposes an alternative structural analysis modeling strategy for monopole steel towers design, considering all the actual structural forces and moments, by using three-dimensional beam and truss finite elements.

1. INTRODUCTION

Telecommunication towers, such as the ones used for emergency response systems, require elevated antennas to effectively transmit and receive radio communications. In the absence of tall buildings that antennas can be mounted to, monopole, self-supporting and guyed towers tend to be the most economical choice for mounting antennas. These types of towers are generally lightweight in comparison to building a solid structure and are also easier to fabricate and erect. Detailed analysis must be performed on a model of the tower in question to analyse whether seismic effects are important and whether a more in-depth analysis is required. TNX software and STAAD(X).TOWER is used to analyse the seismic, wind and ice loading. “Structural Standards for Steel Antenna Towers and Supporting Structures”- also contains detailed revisions in specifying environmental loads and design criteria with a notable increase in emphasis on seismic loads.

2. EASE OF USE

I. Tnx software

Tower Numeric Inc. (TNX) develops software for structural design of communication and wind turbine towers. TNX Tower is a general-purpose modelling, analysis, and design program created specifically for communications towers. It was founded by Peter Chojnacki, whose 20 years of design expertise cover a wide range of structural types from highway bridges to communication towers. TNX Tower is a general-purpose modeling, analysis, and design program created specifically for communications towers using the RS-222, RS-222-A, RS-222-B, EIA-222-C, EIA-222-D, EIA-222-E, TIA/EIA-222-F or TIA-222-G Standards, as well as the Canadian CSA-S37-01 Standard. The program will: Automatically generate nodes and elements for a subsequent finite element analysis (FEA) for standard tower types including self-supporting towers, guyed towers and monopoles.

II. STAAD(X).TOWER

Staad(X).tower easily allows engineers to generate self-supporting towers, guyed towers and monopoles using its parametric setup wizards and Staad(X).tower offers bi-directional interoperability with other Staad(X) products like Staad(X) and Staad foundation to provide additional analysis and design of your structure. Automatically generates wind, ice, and seismic loads, following the tia-222-f and tia-222-g standards.

3. ANALYSIS OF TOWER USING TNX SOFTWARE

The analysis result are obtained directly such as deflection, tilt, twist.

I. Equations

- Front Aspect Ratio = L/w
- Front Area = $L*w$
- Side Aspect Ratio = L/d
- Side Area = $L*d$

II. DETAILS OF ANTENNA

PANEL ANTENNA TMBXX-6516-R2M(50.9"x12"x6.5")

a) Front Area

- $AA = 50.9'' \times 12'' = 4.242 \text{ft}^2$
- Aspect Ratio $= 50.9''/12'' = 4.242$
- $Ca = 1.4 + (2 - 1.4)[(4.242 - 7)/(25 - 7)] = 1.308$
- $(EPA)N = (CA \times AA)N = 1.308 \times 4.242 = 5.548 \text{ft}^2$

b) Side Area

- $AA = 50.9'' \times 6.5'' = 2.297 \text{ft}^2$
- Aspect Ratio $= 50.9/6.5 = 7.83$
- $Ca = 1.4 + (2 - 1.4)[(7.83 - 7)/(25 - 7)] = 1.427$
- $(EPA)N = (CA \times AA)N = 1.427 \times 2.297 = 3.277 \text{ft}^2$

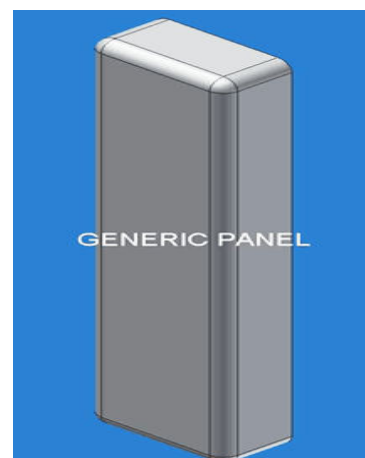


Figure 1: Flat Panel Antenna

Table 1: Section Capacity

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	100 - 48.4167	Pole	TP24.82x14.5x0.25	1	-6.435	1369.390	41.3	Pass
L2	48.4167 - 0	Pole	TP34x23.503x0.313	2	-13.533	2313.630	48.3	Pass
							Summary	
							Pole (L2)	48.3 Pass
							Rating =	48.3 Pass

Table 2: Maximum Tower Deflections

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	100 - 48.4167	48.008	18	4.188	0.022
L2	52.5 - 0	13.239	18	2.365	0.005

Table 3: Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	100 - 48.4167 (1)	0.005	0.408	0.000	0.011	0.000	0.413 ✓	1.000	4.8.2 ✓
L2	48.4167 - 0 (2)	0.006	0.477	0.000	0.010	0.000	0.483 ✓	1.000	4.8.2 ✓

4. ANALYSIS OF TOWER USING STAAD(X).TOWER

The data is input to the software and the result such as deflection, tilt and twist is obtained from the software



Figure 2: 3D Model of tower

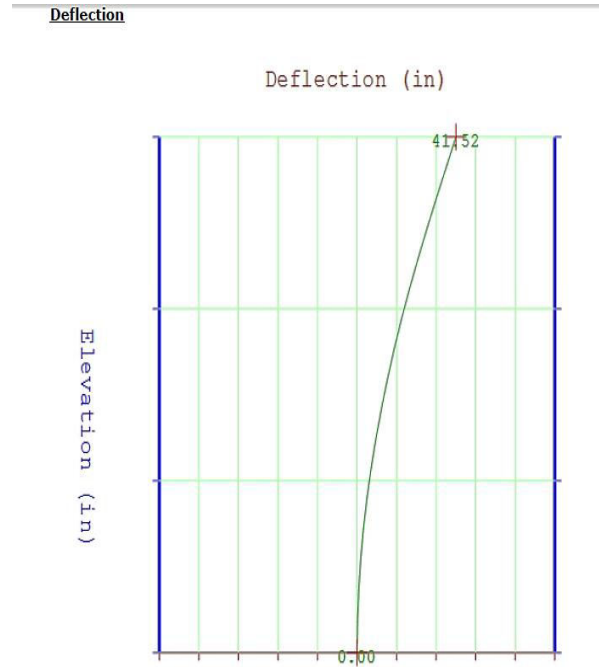


Figure 3: Deflection graph

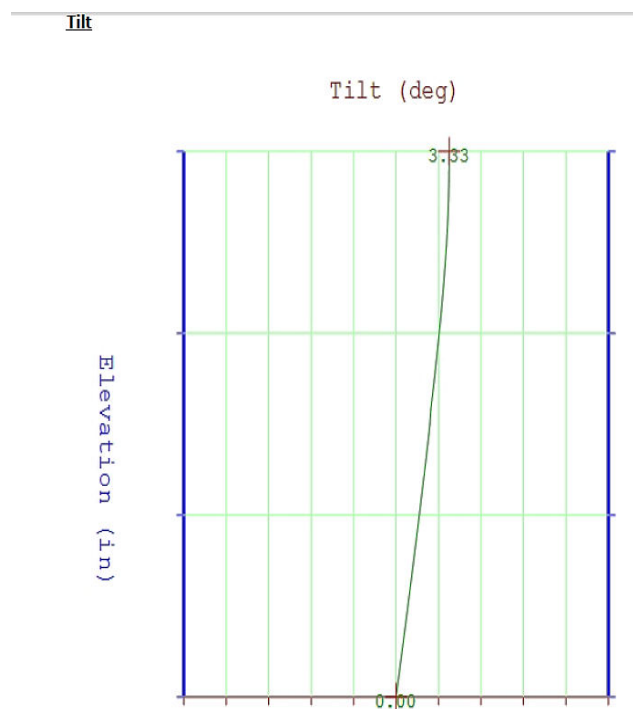


Figure 4: Tilt Graph

5. COMPARISION OF TNX SOFTWARE AND STAAD(X).TOWER

Table 4: Comparison Results

Force/ Reaction in the tower	TNX SOFTWARE(in)	STAAD(X) TOWER(in)
TILT	4.114	3.33
	2.365	
TWIST	0.022	0.01
	0.005	
DEFLECTION	48.00	41.52
	13.239	

6. CONCLUSION

- A simple monopole tower is taken up for study and detailed analysis is carried out using Tnx software.
- The software used gives the detailed design of monopole tower structure and flat panel antenna.
- To establish a communication tower requires a great deal of planning, access to experienced personnel and good tools. Without any of these components, the tower will not stand up for a long time.
- A “base” of good quality is essential for the life time of a tower/mast. If the base is not done with care, fatal accidents can occur which might not just turn out to be expensive but also include personal tragedies.
- A principal feature of the monopoles is their simple design and aesthetical features. The poles are optimal particularly for smaller heights, relatively small antenna areas, and small site locations. As an alternative to the stepped design, the poles can be constructed using slip joints.
- Monopole towers need very less area than any other types of towers. Installations of monopole towers are very easy and economical.

7. REFERENCES

- [1] Design of Steel Transmission Pole Structures, Manual 72, American Society of Civil Engineers (ASCE).
- [2] Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, American Association of State Highway Transportation Offices.
- [3] Guide Specifications for Design of Metal Flagpoles, the National Association of Architectural Metal Manufacturers (NAAMM).
- [4] Metal Flagpole Manual, the National Association of Architectural Metal Manufacturers (NAAMM).
- [5] Research Report 159, Load Testing, Finite Element Analysis, And Design of Steel Traffic-Signal Pole, Boulos, Fu, and Alampalli, New York State Department of Transportation.
- [6] Research Report 131, A Simplified Design Procedure For End-Plates and Base-Plates Of Cantilevered Traffic Structures, Frank Owens, Osman Hag-Elsafi, Sreenivas Alampalli, New York State Department of Transportation

Effect Of Body Weight On Harpaphe Haydeniana In Diverse Trashes

Paper ID	IJIFR/V3/ E9/ 070	Page No.	3525-3528	Subject Area	Zoology
KeyWords	Trashes, Millipede, Leaf Litter, Coconut Waste, Vegetable Waste, Paper Waste, Millicomposts, <i>Harpaphae Haydeniana</i>				

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Abstract

One of the ready to use organic fertilizers widely in use are vermicomposts. Organic waste, when converted into compost becomes a valuable fertilizer. Waste production by human activities is increasing regularly. Millipedes are known to be macro detritivorous terrestrial arthropods. They are omnivorous in nature. It feeds on leaf litters and helps to break down plant material and release up its nutrients for other organisms. These composts are millicomposts. A study was made to observe the status of a millipede, *Harpaphae haydeniana* in different trashes for the benefit of human beings. A change in the quality of wastes plays a key role in the growth of *H.haydeniana*. The highest growth was observed in groups where the millipede feed on leaf litter and coconut wastes. Increased trend was noticed and the results were discussed.

1. INTRODUCTION

Ancient invertebrate animal on earth are millipedes. They play a vital role in the food chain of the ecosystem by converting organic litter wastes into organic fertilizers with minimum effect and to increase the biomass. Composting is a complex phenomenon of transformation of biodegradable wastes into stable organic matter valuable for agriculture by the involvement of a variety of saprophagous fauna and microorganisms.

Saprophagous fauna especially millipedes, and others are known to ingest up to 20-100 % of total litter in forest floor per annum. The faecal matter of saprophagous fauna is characterized by undigested plant residues, fine particulate organic matter, minerals, high water holding capacity and high surface to volume ratio (18-20, 26, 30). The most important requirement of organic matter processing is to increase the surface area by shredding saprophagous fauna, which enhances the microbial activities and in turn bioconversion. Vermicomposts production using earthworms is one of the most attractive, popular and cost- effective approaches in organic waste transformation.

Besides earthworms, millipedes are also useful as saprophagous fauna distributed widely in temperate and tropical habitats. Their body structure and feeding behavior are responsible for mechanical fragmentation, redistribution, mineralization and release essential elements from organic matter. Millipedes being the neglected invertebrate found in our area can be utilized for the benefit of man.

When Blower (1974) reared the Julid Ophiulospilosus (Newport, 1842) from egg to maturity on dead sycamore leaves alone, adult females did not lay eggs. On dissection, only half sized eggs were found. Studies showed that Diplopods are considered to be litter transformers (Lavelle et al., 1997; Tajovsky et al., 1992; Anderson and Bignell, 1980). Fishes fed on *H.haydeniana* shown more growth (Sathya, 2014).

Food quality is an important factor in millipede demography, mainly through its effects on growth and reproduction (Stinganova & Prishtova, 1990; David & Celerier, 1997). Study about the millipede *H.haydeniana* is meagre, hence a work was planned to know the weight change in the millipede for a couple of week time in different common wastes in human habitation.

2. MATERIALS AND METHODS

The millipede, *Harpaphae Haydeniana* belongs to the class Diplopoda, order Polydesmida and family Xsytodesmidge. The body is black, and is distinctively marked along the sides with patches of a yellowish colour, *H.haydeniana* reach a length of 4-5 centimetres (1.6-2.0 in) when mature, and live for 2-3years.

The adults of *H.haydeniana* were collected from moist soil in Thanjavur. (Lat. 10° 47' 13.1964" N and long 79° 8' 16.1700" E). They were cultured in glass bottles. The millipedes were divided into five groups of ten each. They were named as I, II, III, IV and V. The wastes or trashes utilized were commonly available solid waste materials like, leaf litter, coconut wastes, vegetable wastes and paper wastes. These wastes were chosen to feed the millipedes. The wastes or trashes were carefully analyzed without any other inclusions and toxic chemicals. They may interfere the growth and survival of the millipedes. The millipedes and wastes were devoid of intruders. A control was maintained with a normal soil. Initial weights were recorded. The experiments were conducted for a period of two weeks. The weights of the millipedes were recorded in two times of seven days interval.

3. RESULTS AND DISCUSSION

The results were statistically analyzed and tabulated. The study records changes in the quality of wastes play a key role in the growth of *H.haydeniana*. Table 1 clearly indicates the growth in different litters.

Table 1- Impact of wastes on the growth of the millipede *Harpaphae Haydeniana*

Group	Medium	Initial	7 Days	14 Days
I.	Control	37.2 ± 1.5	38.2 ± 0.72	39.6 ± 1.23
II.	Leaf Litter	43.2 ± 0.81	45.8 ± 0.45	47 ± 1.5
III.	Coconut Wastes	44.4 ± 1.01	47.4 ± 0.91	47.6 ± 0.72
IV.	Vegetable Wastes	30 ± 0.93	34.2 ± 0.59	39.6 ± 0.23
V.	Paper Wastes	35.2 ± 0.42	38.8 ± 0.14	39.4 ± 0.52

Harpaphae Haydeniana is a commonly available millipede found profusely during rainy season. Hence this study was made. The results reveal the increase in body weight in all the groups.

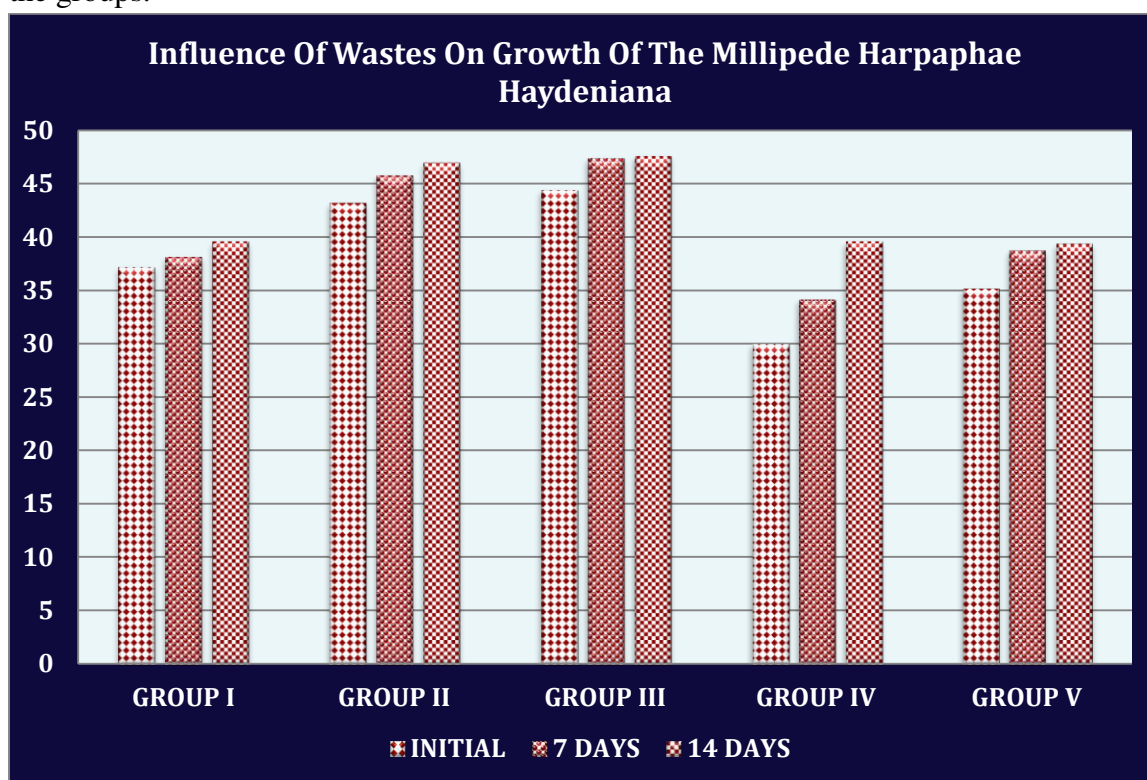


Figure 1-Influence of different wastes on the growth of the millipede *harpaphae haydeniana*

The steady increase was recorded all the groups studied. The highest growth was observed in group II and group III, where millipede fed on leaf litter and coconut wastes. Lesser growth was seen in group IV and group V, where millipede fed on vegetable wastes and paper wastes. When we see from the initial weight, group IV showed marked increase in growth and that is steady. The millipedes fed on vegetable wastes proved

steady and higher growth of 9.6 % than the millipedes fed on other wastes. A very less increase of 2.4% was observed in control, which is the habitat of *H.haydeniana*.

4. CONCLUSIONS

This study reveals that there is some effect of the quality of wastes on the millipede *H.haydeniana*. This proves that they play a major role in ecological food chains. Millipedes play a key role in serving as food for various animals. This proves that *H.haydeniana* are playing important ecological role in nutrient flux, food chains and food for some animals. It needs further elaborate study.

5. REFERENCES

- [1] Anderson, J.M., Bignell, D.E., 1980- Bacteria in the food gut contents and feces of the litter –feeding millipedes *Glomeris marginata* (Villers). *Soil Biology and Biochemistry*. 12, 251 -254.
- [2] [2].David,J.F.and D.Gillon(2002). Annual feeding rate of the millipede *Glomeris marginata* on Holm oak (*quercus ilex*) leaf litter under Mediteranean conditions.*Pedobiologia*.46: 42 -52.
- [3] Gordon Blower, J. 1970 The millipedes of a Cheshire wood *Journal of zoology* Volume 160, Issue 4-April 1970 Pages 455–496
- [4] Lavelle, P., Spain, A.V.2001. *Soil Ecology*. Kluwer Academic Publishers.Netherlands
- [5] [5].Sathya, (2014)-Food Utilization studies of major carp. M.Sc dissertation. Bharathidasan University.
- [6] Striganova,B.R.and Z.G.Prishutova.(1990) Food requirements of Diplopods in the dry steppe Subzone of the USSR.*Pedobiologia*.34: 37 -41.
- [7] Tajovsky,K.S., Santruckova,H.,Hanel,L., Balik,V.,Lukesova,A., 1992. Decomposition of Fecal pellets of the millipede *Glomeris hexasticha* (diplopoda) in forest soil *Pedobiologia*.36: 146 -158.

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Reaping The Benefits Of Demographic Dividend In India Through National Higher Education Mission

Paper ID	IJIFR/V3/ E9/ 070	Page No.	3529-3541	Subject Area	Education
Key Words	Higher Education Sector, Rashtriya Uchchatar Shiksha Abhiyan (RUSA), Knowledge Society , Humane Well-Being, Qualitative Data Analysis Concept Mapping				

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Abstract

Sarva Shiksha Abhiyan (SSA) is Government of India's flagship program for achievement of Universalization of elementary education with 3 key points' access, retention & quality. Being a practitioner in education field at state government sector, initiated & participated research & other academic activities in SSA at elementary & in RMSA at secondary level. On accomplishing goals of SSA at elementary level & RMSA at secondary level, it is urgent need to turn at higher education sector. Because The International Labour Organisation (ILO) has proposed that by 2020, India will have highest 116 million workers in the age bracket of 20- 24 years. To take the advantage of this demographic dividend, focus on strengthening Higher Education is necessary. Rashtriya Uchchatar Shiksha Abhiyan (RUSA), the Indian language term for National Higher Education Mission. It is a holistic scheme of development for higher education. With the demographic dividend background, the policy document was decided to analyse to find out the current position of higher education in India, objectives of the mission & salient features of the document. Present paper focuses the thrust areas of the mission with respect to access, equity & excellence in higher education in India. The paper delimits remaining points in the document like prerequisites, internationalization, vocationalization, appraisal & funding. The document reflects the proper timing of implementing RUSA to take the benefits of critical stage of population development of India. It is consistent with missions at the elementary & secondary levels. Proper implementation will result in inclusive development of society & to make the youth globally relevant in employability & competitive too. With this paper, it is tried to call attention towards India about its highest young population & started to educate them for global preparedness, by overcoming its challenges.

1. INTRODUCTION

The economic crisis is a global issue. 2016 is supposed to be the year of global economics crisis. Education is one of the better instruments to overcome these crises, as it provides the key to build & sustain the future. Ultimate result of quality education is not only economic growth but a knowledge society & humane well-being. According to International Labour Organization (ILO), by the year 2020, India will have the highest young population. This "demographic dividend" in India needs to be exploited to expand the production possibility frontier as well as to meet the skilled manpower requirements of India & abroad. This noticeable change has been also reflected through the 5 year planning program of India. It has direct influence on Higher education sector. Obviously, it would be the responsibility of higher education to develop such a skilled workforce.

2. RATIONALE

The XIIth plan continued its focus on higher education. According to the directives in XIIth plan Ministry of human resource Development has prepared a draft namely, Rashtriya Uchchatar Shiksha Abhiyan (RUSA) a national language term meaning National higher education mission. Higher education sector has proposed a new Centrally Sponsored Scheme, using central funds in a strategic manner & ensuring holistic planning & enhancement of allocations for state institutions. The scheme would spread over the 2 plan periods (XII & XIII) from 2012 - 2017 & 2018 -2022 to achieve the aims of access, equity & excellence. Assessing current position of India in global community it is suggested that, Strategic interventions & foresight in terms of encouraging investments in education & skills development by policy makers are needed to reap maximum benefits of demographic dividend.[1] With this platform, in the present status of economic crisis & unemployment in India, it was interesting to analyse the policy document of RUSA searching, what are the targets to achieve & how it would be going to implement further.

3. BACKGRPOUND TO THE STUDY

The problem selected due to the demographic dividend observed in India. India has a very favourable dependency ratio & it is estimated that, the average age in India by the year 2020 will be 29 years. It means 60% of the population will be in the age group of 15- 59 years highest in world. To reap the benefits of "demographic dividend", the XIIth plan favoured the creation of a comprehensive National Skill Development Mission. It has a focus on higher education in the country. RUSA & the draft is based on the XIIth plan. The XIIth plan points out that, "Several reforms in the regulatory framework are currently underway such as, proper accreditation structure, quick redressal of disputes through educational tribunals and prevention of malpractices and establishment of a national level apex body, that is, National Commission on Higher Education and Research (NCHER) to ensure autonomy of institutions and enhancement of standards and provision for entry of foreign education providers".[4]

SSA is a national mission program for universalisation of elementary education. The Program Evaluation Organisation (PEO), planning commission has found that GER rose from 89% in 2003 to 93% in 2007. There has been improvement in girl's enrolment with gender parity ratio 0.89 in rural schools. An impressive increase is also seen in enrolment of differently abled children. The quality of education imparted to children is a real major concern under SSA.[5]

RMSA is a national mission program for Universalization of secondary education. The scheme was launched in March 2009 with the objective to enhance & to improve the quality of education at secondary level.[6]

Federation of Indian Chamber of Commerce & Industry (FICCI) summit 2014 shows "structural shifts in global economy, productivity enhancement & technological progress are driving demand for high skilled workers, innovations & knowledge workers.[7]. Further they suggest," there is need for creating a 3 faceted globally relevant & competitive higher education system.

- i.) India prominently placed on the global map.
- ii.) India as a hub for talent, that is able to drive competitiveness of the Indian economy & meet the needs of international markets
- iii.) Inculcation of a culture of research, innovation & entrepreneurship that can power high economic growth in the country.[7]

A study report from European countries namely Eurydice Report reviewed, "It examines policy & practice related to the student experience of higher education through 3 stages: access, which requires awareness of the offer of HE, the requirements to be admitted & the process of admission, progression through study program, including support that may be provided when problems are encountered & the transition from HE into the labour market."[8]

The role of higher education as a public good continues to be a fundamental goal & must be supported. The multiple & diverse responsibilities of higher education are ultimately key to the wellbeing of modern society but this expanded function adds considerable complexity & many new challenges.[9]

December 2013 report, the OECD argued that the unemployment rate among highly educated adults across OECD countries increased by only 1.5% from 2008-11; whereas, it had increased by almost 4% for those with lower levels of education. As a result there has been a renewed effort to increase post-secondary enrolment & graduation rates around the world.[10] Therefore from above reviews it is summed up that:

- i.) Higher Education in India is at the top priority, from national as well as international view.
- ii.) Access to higher education should be widened keeping in mind equity factor to attain inclusive growth.
- iii.) Students should be prepared for quality education not only for national employment but of global relevance & competition too.
- iv.) Developing a culture of research, innovations & entrepreneurship in higher education.

- v.) Investments in HE should not be only quantitative but qualitative too.

4. OBJECTIVES OF THE STUDY

- I. To find out the current position of higher education with respect to the key areas.
- II. To find out targets decided to achieve with respect to the key areas.
- III. To find out salient features of the policy with respect to the key areas.

5. DELIMITATIONS OF THE STUDY

Here only normative dimension of the policy is considered & not the left 3- structural, constitutive & technical. Similarly it doesn't touches to any political dimension. The only part considered under study is as follows-

Background of the study, consisting of 2 major points 1.1 XII plan & 1.2 Higher education today. From chapter 4, Rashtriya Uchchatar Shiksha Abhiyan 4.1 Goal, & 4.7 Guiding Principles of RUSA. From guiding principles its sub points are only considered under study & not sub-sub points.

6. DOCUMENT ANALYSIS

To fulfil the 1st objective, the entire content of document was observed. It was fragmented in to data that would be used for the study & would not be used, considering delimitations of the study. The chapters of usable data were selected. During 1st reading paragraphs were summarised in to phrases by content analysis. Simultaneously, they were related to the zest presented under review. To find out the awareness about the policy, current position of higher education concerned 3 academicians & 3 administrators were interviewed.

7. ANALYSIS & INTERPRETATION

A paper-pencil coding was used to analyse the data. Coding in qualitative inquiry defined as, " most often a word or short phrase that symbolically assigns a summative, salient, essence-capturing &/or evocative attribute for a portion of language based or visual data." [18]

DATA ANALYSIS - The analysis of informative data is made page wise & paragraph wise. A word or short phrase assigning summative, salient, essence- capturing attribute was used to represent content in a paragraph.

Table 1: Page & paragraph wise analysis of chapter 1 Background

Sr. No.	Page & Para no.	Understanding
1	1-1	Increase in different aspects of HE, but not in proportionate with population growth & its diverse needs.
2	1-2	Present challenges- access, equity, quality, funding, etc.
3	1-3	Multiple roles HE has to perform- creating knowledge, acquiring new capabilities, developing human resources, etc.

4	2-1	Philosophical paradigm of inclusive growth reflected from XIIth plan & identified issues to be considered.
5	2-2	Quality for global competitiveness
6	2-3	Strategic shift explained in XIIth plan
7	2-4	Outline of the document
8	3-1	Policy based on past National policy of Education, (NPE,1986)
9	3-2	Review of Radhakrishnan commission on University Education(1948)
10	3-3	Review of NPE(1986)- 5 goals- access, equity, Quality, Relevance & value based education
11	4-1	Plan of action of NPE, 1992
12	4-2	Analysis of past 5year plans. Vth- developing infrastructure, VI- Quality improvement, VIIth- research & academic development, VIIIth- need for funding, IXth- gearing for social, economic & technological changes, Xth- basis for 21 st century
13	4-3	XIth- broadening access, inclusive development & quality

Observation 1 - Starting four pages of chapter 1, Background are devoted to summarising the review of past policies on HE.

2. First major point of the chapter 1, Background is **1.1 XII Plan**. It consists of sub-point 1.1.1 as -Objectives. They are enumerated from 1 to 5. Therefore, encoded by finding out keywords in them as follows-

Table No.2- Analysis of objectives from 1.1 XII plan of Chapter1 Background

Sr. No.	Objective No.	Keyword found
1	1	Global relevance
2	2	Quality improvement
3	3	Inequalities in access to Quality
4	4	Increasing access to HE
5	5	Autonomy & accountability

Observation 2 - The objectives of XIIth plan continued the key areas access, equity & excellence for global relevance as with XIth plan. Autonomy & accountability are additional here.

3. The next point is **1.1.2 Approach**. To analyse it, concept mapping was used as follows-

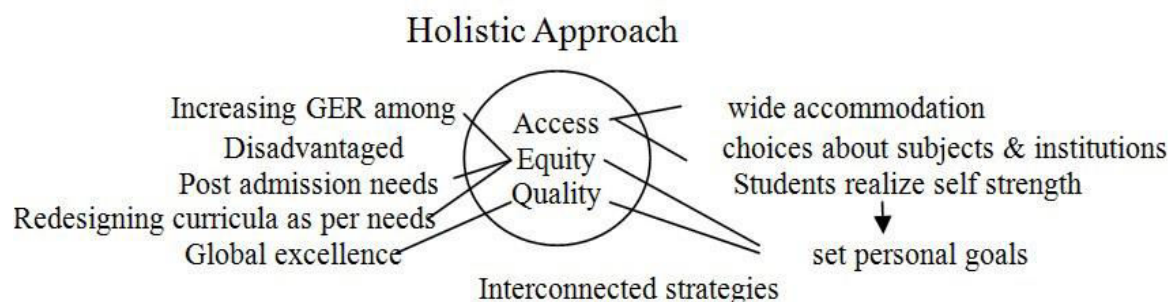


Figure 1: Concept mapping for sub-point 1.1.2 Approach

Observation 3: Concept mapping shows approach of the XIIth plan, which states interconnected strategy needed to deal with issues of access, equity & excellence.

4. The next sub- point is **1.1.3** about Strategic Shift. It is described by enumerating in 10 points. These points are encoded by finding out keywords for them.

Table 3: Analysis of sub-point 1.1.3 Strategic shift from chapter 1

Sr. No.	Shift No.	Keyword found
1	1	Strategic use of funds
2	2	Reforms in governance
3	3	Autonomy linked with accountability
4	4	Targeted, integrated & effective equity schemes
5	5	Multidisciplinary research universities & vocational Institutes
6	6	Integrating teaching & research
7	7	Input centric & credential focused to learner centric
8	8	Consolidate institutions & expand capacity for lower cost.
9	9	Move towards internationalism
10	10	Creation of alliances, networks among institutes

Observation 4: A shift is planned in several critical areas ranging from issues of access, equity to funding, governance, research, teaching-learning, monitoring, cost effectiveness, autonomy & accountability.

5. First major point XIIth plan of Chapter 1 follows second as **1.2 Higher Education Today**. It contains description along with graphs. Therefore it is encoded page wise, graph & its interpretation wise, as follows-

Table 4a- Figure wise analysis of the document- 1.2.1 for access

Sr.no.	Page	Figure	Figure Title	Understanding
1	8	1	India's GER over time	Current GER 19. 4%, to achieve 32% till, 2022
2	9	2	Growth of universities & colleges	Continuous growth in universities from 30 to 700 & in colleges 695 to 35539 during post-independence period
3	10	3	Average age in 2020	Average age in Europe will be 47, in USA 40, in Japan 46 & in India will be 29.
4	11	4	State wise Median age (yrs) population for 2026	Will range from 26.85 in UP to 37.67 in Kerala
5	12	5	GER of selected countries in 2012-13	Ranges from 15% in South Africa & 95% in USA. India having 18%
6	13	6	CPI for 374 districts with GER below	Paucity of HE institutes serving in many remote areas. 1/3rd of the weak districts are in tribal/hilly/ border/forest areas

			national average (as of 2001)	
7	15	7	GER by state	Differs widely across state, ranging 0.0 for Lakshdweep to 41.4 for Chandigarh
8	15	8	Institutional density by state	Differs widely across state, ranging 0.2 for Arunachal Pradesh to 236.8 for Chandigarh
9	16	9	State wise distribution of institutions	Universities ranging from 0.0 for Islands to 61 in UP & colleges 3 in Lakshdweep to 4836 in Maharashtra
10	17	10	GER in public & private aided & private unaided	More than half of the students enrolled today in HE are under private institutes. 46% GER in public while 50% in private space.
11	18	11	Transition from higher secondary to higher education	Improvement in transition rate from 2007 to 2009 for higher secondary to higher education
12	18	12	Students transiting from higher secondary to higher education	Success of SSA & RMSA leads to successive improvement no. of students transiting from higher secondary to higher education.

Observation 5: Table 4a indicates that, current GER is 19.4% , which has to be raised to 32.0%, till 2022. There is disparity in GER state wise. Internationally compared GER of India is 2nd last.

Table 5: Paragraph wise analysis of 1.2.1.1 from chapter 1 Background

Page , Para no.	Understanding
19-1	Target GER in XIIth plan 25.2% by 2017 based on XIth plan access experience
19- 2	Model degree colleges where GER less than national average
19-3	Response to model degree college was low. The reasons are, too strict eligibility conditions, lack of funds with state government, The central contribution of 1/3 rd of capital cost was considered very low by states.
19-4	Recommendation of planning commission for subsuming similar schemes in the XIIth plan made the basis of RUSA

Observation 6 - In XIth plan target GER was 25.2% by 2017. Major schemes of this plan were setting up model degree colleges, where GER is less than national average. The response was low due to funding problem. Second scheme was upgrading existing HE institutes in districts where GER is between 12.4% to 15%.

7. Major point Higher Education Today has next point 1.2.2 Equity. It is explained through graphs. Therefore, analysed figure wise as follows-

Table 4b- Figure wise analysis of the document-1.2.2 for Equity

Sr.no.	Page	Fig.	Figure Title	Understanding
1	20	13	GER across categories compared in NSS 61st round & NSS 64th round	SC, OBC & others show successive improvement with slight decline for STs. Muslim, non-Muslims & Rural, urban & overall show successive increase in GER
2	22	14	GER -ST across states	Ranges from 0.0 for Delhi & Bihar to Punjab 43.1
3	22	15	GER -SC across states	Ranges from 0.0 for Nagaland & Mizoram to Sikkim 35.5
4	23	16	GER -OBC across states	Ranges from 0.0 for Lakshadweep to Mizoram 79.2
5	23	17	GER-Others across states	Ranges from 9.9 for Meghalaya to Chandigarh 60.3
6	24	18	GER (18-23) & inter caste disparities	Ranges from 9.7% for ST to 28% for others
7	24	19	GER among religious groups	Ranges from 11.3 for Muslims to Zoroastrians 60.3
8	24	20	GER among religious groups- rural, urban	Varies from 6.8% for rural Muslims to 38.5% rural Jain & 19.20%for urban Muslims to 56.2% urban Jain
9	25	21	GER of inter caste categories along Socio-Religious groups	ST GERs are lowest across groups while 'others' are placed far above the disadvantaged social groups
10	25	22	Location wise distribution of Institutions - rural, urban	Increasing private colleges & universities in urban areas, the distribution is tilting towards urban areas. Rural area should not deprive of access to HE.
11	26	23	GER in rural & urban areas	Lower in rural (13.9%) than urban (32.5%)
12	26	24	GER among Occupational groups rural	Lowest (7.0%) for agricultural labour & highest (33.5%) for others.
13	27	26	GER males & females-rural, urban & SC,ST	Females are far behind than males. The difference between GER for male, female is higher in urban than rural. Females alarmingly lower in SC & ST population
14	28	27	Distribution of Women's universities & colleges	1.10% women's universities & 8.60% women's colleges
15	29	28	Gender parity across states	Least in Arunachal Pradesh for all categories & SC, least in Andhra Pradesh

				for ST, Highest in Lakshadweep for ST & all categories, highest in Diu-Daman for SC
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Observation 7 - Table 4b indicates that, there is disparity between GERs of variables related to equity. They are religious, social, geographical groups & male/female. All groups need improvement in GER.

8. Next sub- point is 1.2.3 Excellence. It also explained through graphs. Therefore, analysed figure wise as follows-

Table 4c- Figure wise analysis of the document-1.2.3 for Excellence

Sr.no.	Page	Fig.	Figure Title	Understanding
1	31	29	Major R&D Investments : country share	Lowest 0.8% as compared to developed countries.
2	32	30	World publications of selected countries (in000's)	2 nd lowest in 2002 & 3 rd lowest in 2007
3	32	31	Number of Ph.Ds. (in000's)	Lowest as compared to China & US
4	33	32	Share of world researchers	India is lowest (2.3%) in 2007 compared with developed countries
5	34	33a	Changing Trends in No. of Publication	India has started since 2002 to regain the volume share of scientific publication lost during 1980s
6	34	33b	Trends in global share of publication	India could vie for a share of about 5% within next 5 years, up from its current 3.5%
7	35	34	Comparative performance of India with respect to emerging economies with respect to SCI publications	India works favourable with many other economies except China
8	35	35	Comparison of Citation Impacts of Indian Publications with some developed economies	At present India is not at well, but next few decades it will emerge as important power
9	36	36	Comparison of citation impacts of Indian Publications with some emerging economies	India has to scale up its R&D effort engagement
10	36	37	Growth of teaching staff in universities & colleges	Two- fold increase in growth over last decade
11	37	38	Growth of HE: University/ colleges/students/ enrolment/ Teaching staff:	Not in pace with growth in enrolment in colleges & universities

			1950-51 to 2012-13	
12	37	39	Student- teacher ratio in selected countries	Very low 24:1 as compared to other countries
13	39	40	Occupational level wise teaching staff in universities & colleges	Quality faculty is not in use hampering quality education. Affiliated colleges are privately owned & cannot afford Senior, experienced faculty
14	40	map	No. of colleges in India	UP, AP & Maharashtra have colleges ranging 4000- 4999, Karnataka having 3370, MP, Tamil Nadu & Rajasthan ranging from 2000-2999 & rest are having ranging from 0- 1999.
15	41	41	Proportion of universities & colleges accredited by NAAC	Less than 1/3 rd universities & only 14.5 % colleges accredited so far.

Observation 8 - Table 4c indicates that, for research, publication, citation, teaching staff, student teacher ratio, accreditation when compared with international level, India is at lower position.

9. The next sub- point is funding. It also explained through graphs. Therefore, analysed figure wise as follows-

Table 4d- Figure wise analysis of the document-1.2.4 funding

1	44	42	Expenditure on education at a % of GDP	During India's post-independence period total expenditure on HE increased remarkably
2	44	43	Expenditure on HE in India as % of GDP	About 1/3 rd of total expenditure on education is expended from 2007-2011.
3	45	44	Government Expenditure on HE in India	Share of central government is more & is increasing whereas share of state is decreasing
4	46	45	Cost/ expenditure per student: 1990-91 to 2009-10	During post-independence period cost/student has increased.

Observation 9: Table 4d indicates that, during post-independence period, expenditure on education has been increased.

10. After completing data analysis of Chapter 1, study deals with the chapter 4, namely Rashtriya Uchchatar Shiksha Abhiyan. It contains first point 4.1 as Goal. The objectives are enumerated and analysed as follow-

Table 6- Analysis of objectives from 4.1 Goal of RUSA, Chapter 4

Sr.No.	Objective	Keyword found
1	1	Quality improvement & accreditation as mandatory

2	2	Reforms in system promoting autonomy
3	3	Academic & examination reforms
4	4	Creation of Research university best in world
5	5	Reforms in the affiliation system
6	6	Ensure availability of quality faculty
7	7	Atmosphere of research & innovations
8	8	Institutional expansion to achieve enrolment targets
9	9	Correct regional imbalance in access
10	10	Improve equity

Observation 10: Table no. 6 indicates that, the goal & objectives of RUSA are consistent to those formulated in XIth & XII plan. Rather the objectives are stated to fulfil the inadequacies in XIth plan.

11. Major point 4.7 is guiding principles of RUSA. It is analysed as follows-

Table 7: Guiding principles of RUSA

Page	Subpt	Title	Understanding
90	4.7.1	Performance based outlays & outcome based reimbursements	Funding based on performance shown according to the targets. Performance will be norm based focusing on key areas access, equity & excellence.
90	4.7.2	Incentivizing & disincentivizing	For desirable actions, fulfillment of norms, compliance to rules & regulations will get incentives & non- fulfillment will get penalties/ reduced allocations
91	4.7.3	Apolitical decision-making	Decision making about allocations will be done in an unbiased, apolitical & professional manner. Same for states. leadership on the basis of merit only
91	4.7.4	Disclosure based governance	A greater participation of all stakeholders. Institutions are responsible for quality to authorities, students, parents & the society.
91	4.7.5	Autonomy	Autonomy linked with accountability for creation of more dynamic, agile & goal- oriented institutions. All institutions have same set of norms required for achieving intellectual excellence in the growth & development of knowledge. University autonomy should not be delinked from future of students & country. autonomy at various levels like, financial, administrative, academic.
98	4.7.6	Equity based development	Any growth in the higher education sector must create equal opportunities for women, disadvantaged classes & the differently-abled. A greater focus on development of rural & tribal

			areas. Equity must not be compromised.
99	4.7.7	Quality & research focus	Focus on better quality of research & innovation. Each state can think of re-orienting one university as research university & in each district 1 existing college can be upgraded into a Model Degree college. Full use of ICT strategies. Essential mandate of university is to train & produce high quality personnel who can survive in challenging environment of a rapidly changing society. Basic & fundamental research ought to happen in universities since same does not take place in industry. Funding should be outcome- oriented. Most of universities need to strengthen the support for intellectual property rights. Some researches should be socially relevant.

Observation 11: Table no.7 indicates that, guiding principles are very similar to the objectives of XIIth plan. Moreover, they are consistent to fundamentals of SSA & RMSA. The more space given to the point's autonomy & research reflects its significance in RUSA.

8. FINDINGS & CONCLUSION

- i. The key areas of the mission are consistent with missions at elementary & secondary level with key areas access, equity & excellence as directed from XIIth plan.
- ii. GER of India 19.4% is below to the world average of 29% (as of 2010). The target of GER is 32% up to the year 2020.
- iii. For inclusive development of society with holistic approach equity in access & process of higher education is expected, which is not satisfactory in current situation.
- iv. Excellence in higher education to face the rapid economic & technological developments at Glo-local levels. Currently student's preparation for global relevance & competition is not at mission level.
- v. Governance reforms focussing on institutional autonomy with accountability, as directed through XIIth plan is reflected through guiding principles of RUSA. Knowledge development through innovations & research is insisted with raising investment on R&D.
- vi. The data provided in the draft is based on sufficient, authorised & authentic references provided.
- vii. Increasing awareness about the policy among people, related academicians & administrators would help to overcome challenges identified & implement policy fastly.

9. REFERENCES

- [1] Nandi, R.(2014). India's Position in the global community: With respect to Higher Education Scenario. International Journal Of Educational Planning & Administration. Vol.4 pp37-38. Retrieved from [http:// www.ripublication.com](http://www.ripublication.com)
- [2] Labaree R.V. (2009). The literature review -organising your social sciences Research Paper. retrieved from [libguides.usc.edu/writingguide/literature review](http://libguides.usc.edu/writingguide/literature%20review).

- [3] Faster, Sustainable & More Inclusive Growth (2011) : Government of India, Planning commission. pp.100.
- [4] Evaluation Report on SSA (2010). Program Evaluation Organisation, Government Of India, SSA retrieved from www.rmsaindia.org
- [5] Higher Education in India: moving towards global relevance & competitiveness, FICCI Higher Education Summit 2014.pp12 retrieved from www.ey.com/...Ey...Higher_education_in_india/.../Ey_higher-education-in-india-p.
- [6] Eurydice report,(2014). Modernisation of Higher Education in Europe. Lukembourg: Publication office of the European Union. Retrieved from European Commission/EACEA/Euridice, 2014 pp.9
- [7] UNESCO (2009). World conference on Higher Education. Trends in global higher education: Tracking an Academic Resolution retrieved from <http://www.uts.unesco.org/Library/Documents/trends-global-higher-educatio2009world-conference-enpdf>.
- [8] OECD (2014). Skills beyond school: Synthesis Report, OECD Reviews of vocational education & Training. OECD publishing. retrieved from <http://dx.doi.org/10.1787/9789264214682-en>
- [9] Document analysis -Creating & Documenting Electronic texts retrieved from <http://ota.ox.ac.uk/documents/creating/cdetchap2.html>
- [10] Cooper, Fusarelli & Randall (2004). Better policies, better schools: Theories & applications. Boston, MA : Allyn & Bacon
- [11] Best, J.W. & Kahn, J.V. (1995). Research in Education. New Delhi: Prentice-Hall of India Private Limited.
- [12] Prior, L.(2003). Using Documents in Social Research. London, UK: SAGE publication.
- [13] Bowen, Glenn A, (2009). Document analysis as a qualitative Research method, Qualitative Research Journal, vol.9no.2pp.27
- [14] Saldana, J. (2009). The coding manual for qualitative researches. London, UK: Thousand Oaks, CA: Sage Publication.

Analyzing Security requirements for On Demand Routing Protocols In Mobile Adhoc Networks

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Abstract

Mobile Network assumes no pre-deployed infrastructure is available for routing packets end-to-end in a network, and instead relies on intermediary peers. Securing ad hoc routing presents challenges because each user brings to the network their own mobile unit, without the centralized policy or control of a traditional network. Especially, Security flaws of routing protocol may cause severe problems under ad hoc network. In this paper we briefly present the most popular on-demand routing protocol ADOV and potential security problems of AODV. Then, this paper analyzes security requirements for ad hoc routing protocols and proposed solutions such as ARAN, SAODV, SAR and SRP.

1. INTRODUCTION

A **mobile network** (MANET), sometimes called a mobile mesh network, is a self-configuring network of mobile devices connected by wireless links. Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Each must forward traffic unrelated to its own use, and therefore be a router. The primary challenge in building a MANET is equipping each device to continuously maintain the information required to properly route traffic. Securing ad hoc routing presents another challenge because each user brings to the network of their own mobile unit, without the centralized policy or control of a traditional network.

Ad hoc network routing protocols are challenging to design, and secure ones are even more so. Wired network routing protocols do not handle well the type of rapid node mobility and network topology changes that occur in ad hoc networks; such protocols also

have high communication overhead because they send periodic routing messages even when the network is not changing. So far, researchers in ad hoc networking have generally studied the routing problem in a non- adversarial network setting, assuming a trusted environment; relatively little research has been done in a more realistic setting in which an adversary may attempt to disrupt the communication.

We focus here on *on-demand* (or reactive) routing protocol for ad hoc networks, in which a node attempts to discover a route to some destination only when it has a packet to send to that destination. On-demand routing protocols have been demonstrated to perform better with significantly lower overheads than periodic (or proactive) routing protocols in many situations, since they are able to react quickly to the many changes that may occur in node connectivity, yet are able to reduce (or eliminate) routing overhead in periods or areas of the network in which changes are less frequent.

The following section presents related work in securing the routing protocols. Section 3 presents a brief introduction to the ad hoc routing protocol AODV. Section 4 presents the possible attacks that a malicious node can use for disrupting the operation of a routing protocol in a self-organized network. In Section 5 we describe security requirements of ad hoc networks and in section 6 we analyze the already proposed secure ad hoc routing protocols that exist in the literature and present their operational principles.

2 . RELATED WORK

Ad hoc On-Demand Distance Vector (AODV) routing is a routing protocol for mobile ad hoc networks and other wireless ad-hoc networks. It is jointly developed in Nokia Research Centre of University of California, Santa Barbara and University of Cincinnati by C. Perkins and S. Das. It is an on-demand and distance-vector routing protocol, meaning that a route is established by AODV from a destination only on demand [1]. Traditional ad hoc routing protocols do not provide any security therefore secure routing in MANETs has been of interest for quite long time in the research community. In this section we will give a short overview of existing work and entry points to the literature.

Zhou and Haas [2] primarily discuss key management. They devote a section to secure routing, but essentially conclude that “nodes can protect routing information in the same way they protect data traffic”. They also observe that denial-of-service attacks against routing will be treated as damage and routed around.

Some work has been done by S. Marti, T. J. Giuli [3] to secure ad hoc networks by using misbehaviour detection schemes. This approach has two main problems: first, it is quite likely that it will be not feasible to detect several kinds of misbehaving (especially because it is very hard to distinguish misbehaving from transmission failures and other kind of failures); and second, it has no real means to guarantee the integrity and authentication of the routing messages.

Kimaya Sanzgiri et al [4] proposed ARAN, a routing protocol for ad hoc networks that uses authentication and requires the use of a trusted certificate server. In ARAN, every node that forwards a route discovery or a route reply message must also sign it, (which is

very computing power consuming and causes the size of the routing messages to increase at each hop), whereas the proposal presented in this paper only require originators to sign the message. In addition, it is prone to reply attacks using error messages unless the nodes have time synchronization.

Hubaux, et al. have proposed a method that is designed to ensure equal participation among members of the ad hoc group, and that gives each node the authority to issue certificates [5]. Kong, et al. [6] have proposed a secure ad hoc routing protocol based on secret sharing; unfortunately, this protocol is based on erroneous assumptions, e.g., that each node cannot impersonate the MAC address of multiple other nodes. Yi, et al. [7] also have proposed a general framework for secure ad hoc routing called the SAR.

Papadimitratos and Haas [8] proposed a protocol (SRP) that can be applied to several existing routing protocols. SRP requires that, for every route discovery, source and destination must have a security association between them. Furthermore, the paper does not even mention route error messages. Therefore, they are not protected, and any malicious node can just forge error messages with other nodes as source. Securing the AODV protocol has been made by Zapata with his SAODV [9]. This is the background of secure routing protocols for the AODV routing protocol. In this paper I review all these routing protocols.

3.AD HOC ON DEMAND DISTANCE VECTOR ROUTING (AODV)

Routing protocols in mobile networks are subdivided into two basic classes:

- Proactive routing protocols
- Reactive routing protocols

The proactive routing protocols (e.g. OLSR) are table-driven. They usually use link-state routing algorithms flooding the link information. Link-state algorithms maintain a full or partial copy of the network topology and costs for all known links. The reactive routing protocols (e.g. AODV) create and maintain routes only if these are needed, on demand. They usually use distance-vector routing algorithms that keep only information about next hops to adjacent neighbours and costs for paths to all known destinations. Thus, link-state routing algorithms are more reliable, less bandwidth-intensive, but also more complex and compute- and memory-intensive.

An alternative approach to the one followed by table-driven protocols is the source-initiated on- demand routing. According to this approach a route is created only when the source node requires one to a specific destination. A route is acquired by the initiation of a *route discovery* function by the source node. The data packets transmitted while a route discovery is in process are buffered and are sent when the path is established. An established route is maintained as long as it is required through a *route maintenance* procedure. The Ad hoc On-demand Distance Vector (AODV) routing protocol and the Dynamic Source Routing protocol are examples of this category of protocols also known as *reactive*. AODV is a relative of the Bellmann-Ford distant vector algorithm, but is adapted to work in a mobile environment. AODV determines a route to a

destination only when a node wants to send a packet to that destination. Routes are maintained as long as they are needed by the source. Sequence numbers ensure the freshness of routes and guarantee the loop-free routing.

3.1. Merits of AODV

The AODV routing protocol does not need any central administrative system to control the routing process. Reactive protocols like AODV tend to reduce the control traffic messages overhead at the cost of increased latency in finding new routes. AODV reacts relatively fast to the topological changes in the network and updates only the nodes affected by these changes. The HELLO messages supporting the routes maintenance are range-limited, so they do not cause unnecessary overhead in the network. The AODV routing protocol saves storage place as well as energy. The destination node replies only once to the first request and ignores the rest. The routing table maintains at most one entry per destination. If a node has to choose between two routes, the up-to-date route with a greater destination sequence number is always chosen. If routing table entry is not used recently, the entry is expired. A not valid route is deleted: the error packets reach all nodes using a failed link on its route to any destination.

3.2. Drawbacks of AODV

It is possible that a valid route is expired. Determining of a reasonable expiry time is difficult, because the nodes are mobile, and sources' sending rates may differ widely and can change dynamically from node to node. Moreover, AODV can gather only a very limited amount of routing information; route learning is limited only to the source of any routing packets being forwarded. This causes AODV to rely on a route discovery flood more often, which may carry significant network overhead. Uncontrolled flooding generates many redundant transmissions which may cause so-called broadcast storm problem. The performance of the AODV protocol without any misbehaving nodes is poor in larger networks. The main difference between small and large networks is the average path length. A long path is more vulnerable to link breakages and requires high control overhead for its maintenance. Furthermore, as a size of a network grows, various performance metrics begin decreasing because of increasing administrative work, so-called administrative load. AODV is vulnerable to various kinds of attacks, because it based on the assumption that all nodes will cooperate. Without this cooperation no route can be established and no packet can be forwarded. There are two main types of uncooperative nodes: malicious and selfish. Malicious nodes are either faulty and cannot follow the protocol, or are intentionally malicious and try to attack the network. Selfishness is no cooperation in certain network operations, i.e. dropping of packets which may affect the performance, but can save the battery power.

4. EXPLOITS ALLOWED BY EXISTING PROTOCOLS

In the wired environment, the routing protocols are based on trust relationship of two participating nodes when exchanging routing information since a lot of routers in the Internet usually have been operated by trustworthy companies. Current ad hoc routing

protocols also inherently trust all participants because most of them are based on the routing protocols of wired networks. Thus, most ad hoc routing protocols are cooperative and depend on neighbouring nodes to route packets. However, this naïve trust model allows a malicious attacker to paralyze an entire ad hoc network by easy way, such as inserting erroneous routing information. To achieve availability of ad hoc networks, routing protocols should be robust against this kind of malicious attacks. Then, let's look at the common security threats in ad hoc routing protocols. There are two sources of attacks to routing protocols. The first one is done by external attackers. For example, by injecting erroneous routing information, replaying old routing information, or distorting routing information, an attacker could successfully partition a network or introduce excessive traffic load into the network by causing retransmission and in efficient routing. The second one, which is more severe, is done by compromised nodes, which might advertise incorrect routing information to other nodes. Under this attack, Detection of such incorrect information and compromised node is very difficult.

We can also classify the attacks into passive and active ones.

4.1. Passive attack

It means that the attacker does not disrupt the operation of a routing protocol but only attempts to discover valuable information by listening to the routing traffic. The major advantage for the attacker in passive attacks is that in a wireless environment the attack is usually impossible to detect. Furthermore, routing information can reveal relationships between nodes; disclose their IP addresses, or even the network topology. If a route to a particular node is requested more often than to other nodes, the attacker might expect that the node is important for the functioning of the network, and can decide that node as a victim of his attack, which might bring the entire network down.

4.2.Active attack

Besides the passive attack, this active attack is performed by the attacker who can inject arbitrary packets into the network. The goal may be to attract packets destined to other nodes to the attacker for analysis or just to disable the network. A major difference in comparison with passive attacks is that an active attack can sometimes be detected. But, a stealth attack, which is proposed in recent paper, enables the attacker to do the same kind of active attack with hiding his existence.

Based on this threat analysis and the identified capabilities of the potential attackers, we will now discuss several specific attacks that can target the operation of a routing protocol in an ad hoc network.

- a. **Location disclosure:** Location disclosure is an attack that targets the privacy requirements of an ad hoc network. Through the use of traffic analysis techniques or with simpler probing and monitoring approaches an attacker is able to discover the location of a node, or even the structure of the entire network.
- b. **Black hole:** In a black hole attack a malicious node injects false route replies to the route requests it receives advertising itself as having the shortest path to a destination. These fake replies can be fabricated to divert network traffic through

the malicious node for eavesdropping, or simply to attract all traffic to it in order to perform a denial of service attack by dropping the received packets.

- c. **Replay:** An attacker that performs a replay attack injects into the network routing traffic that has been captured previously. This attack usually targets the freshness of routes, but can also be used to undermine poorly designed security solutions.
- d. **Wormhole:** The wormhole attack is one of the most powerful presented here since it involves the cooperation between two malicious nodes that participate in the network. One attacker, say node A, captures routing traffic at one point of the network and tunnels them to another point in the network, say to node B, that shares a private communication link with A. Node B then selectively injects tunnelled traffic back into the network. The connectivity of the nodes that have established routes over the wormhole link is completely under the control of the two colluding attackers.
- e. **Blackmail:** This attack is relevant against routing protocols that use mechanisms for the identification of malicious nodes and propagate messages that try to blacklist the offender. An attacker may fabricate such reporting messages and try to isolate legitimate nodes from the network. The security property of non-repudiation can prove to be useful in such cases since it binds a node to the messages it generated.
- f. **Denial of service:** Denial of service attacks aim at the complete disruption of the routing function and therefore the whole operation of the ad hoc network. Specific instances of denial of service attacks include the routing table overflow and the sleep deprivation torture. In a routing table overflow attack the malicious node floods the network with bogus route creation packets in order to consume the resources of the participating nodes and disrupt the establishment of legitimate routes. The sleep deprivation torture aims at the consumption of batteries of a specific node by constantly keeping it engaged in routing decisions.
- g. **Routing table poisoning:** Routing protocols maintain tables which hold information regarding routes of the network. In poisoning attacks the malicious nodes generate and send fabricated signalling traffic, or modify legitimate messages from other nodes, in order to create false entries in the tables of the participating nodes. For example, an attacker can send routing updates that do not correspond to actual changes in the topology of the ad hoc network. Routing table poisoning attacks can result in selection of non-optimal routes, creation of routing loops, bottlenecks and even partitioning certain parts of the network.
- h. **Impersonation:** Current ad hoc routing protocols do not authenticate source IP address. IP address information of a packet can be simply modified by the compromised node or malicious attacker and even MAC address can be changed since most open source device drivers now allow the user to change the MAC address. A malicious node can launch many attacks by altering its MAC or IP address. Both AODV and DSR are susceptible to this attack.

5. SECURITY REQUIREMENTS OF AD HOC NETWORKS

A good secure routing algorithm prevents each of the exploits presented in Section 4; it must ensure that no node can prevent successful route discovery and maintenance between any other nodes other than by non-participation. In sum, all secure ad hoc routing protocols must satisfy the following requirements to ensure that path discovery from source to destination functions correctly in the presence of malicious adversaries. The term security protocol traditionally refers to authentication protocols, or cryptographic protocols, where the goal is to securely share information (e.g., a message or a session key) between two nodes. Security analysis for authentication protocols evaluates if it is possible for a third party (i.e., the adversary) to obtain access to the protected key, regardless of intermediate nodes within the communication path [10]. Conversely, security evaluations for MANET secure routing protocols must consider actions taken by intermediate nodes. That is, we must consider whether the intermediate nodes can impact the secure routing protocol's intended goal. More specifically, we must consider route accuracy (securing the route discovery phase) and protocol reliability (securing the data forwarding phase). A routing protocol is considered to maintain route accuracy if it produces routes that exist within the current network topology. Route accuracy is an integrity issue, ensuring that a malicious attacker has not corrupted the path obtained during the route discovery phase. Since the routes obtained during route discovery can fail due to both malicious actions and non-malicious failures (e.g., mobility, hardware failures, etc.), the routing protocols must also provide reliability. Once route paths begin to fail, reliability mechanisms identify that the path is no longer operating and initiate a new route discovery process or select an alternate path if multi-path protocols [11] are being utilized. Reliability mechanisms may also attempt to detect and remove malicious nodes via probing protocols.

5.1. Secure Ad Hoc Routing

There exist several proposals that attempt to architect a secure routing protocol for ad hoc networks, in order to offer protection against the attacks mentioned in the previous section. These proposed solutions are either completely new stand-alone protocols, or in some cases incorporations of security mechanisms into existing ones (like DSR and AODV). As we will see, the design of these solutions focuses on providing countermeasures against specific attacks, or sets of attacks. Furthermore, a common design principle in all the examined proposals is the performance-security trade-off balance. Since routing is an essential function of ad hoc networks, the integrated security procedures should not hinder its operation. Another important part of the analysis is the examination of the assumptions and the requirements that each solution depends on. Although a protocol might be able to satisfy certain security constraints, its operational requirements might thwart its successful employment.

5.2. ARAN

ARAN was proposed by Sanzgiri et al in 2002 [4], targeting to combat attacks including unauthorized participation, spoofed route signalling, alteration of routing

messages, replay attacks, etc. Similar to other secure routing protocols, ARAN is also a security adds on over on-demand routing protocols. It provides authentication, message integrity and non-repudiation as part of minimal security policy for ad hoc environment.

ARAN stands for Authenticated Routing for Ad hoc Networks. It is motivated to detect and protect against malicious actions by third parties and peers in an ad hoc environment. ARAN is a security scheme, which can be applied to any on-demand routing protocols. It takes the advantages of PKI based digital signature scheme to provide security features including authentication, message integrity and non-repudiation.

ARAN consists of three stages: a preliminary certification process, a mandatory end-to-end authentication stage and an optional stage providing secure shortest path. To deploy these three stages, ARAN requires the use of a trusted certificate server T and public key cryptography. Each node, before entering the network, must request a certificate from T , and will receive exactly one certificate after securely authenticating their identities to T .

We provide a security analysis of ARAN by evaluating its robustness in the presence of the attacks introduced in Section 4. We also compare performance of ARAN to the AODV routing protocol [1].

Unauthorized participation: ARAN participants accept only packets that have been signed with a certified key issued by the trusted authority. In practice, many single-hop 802.11 deployments are already using VPN certificates; this is the case on the UMass campus. Mechanisms for authenticating users to a trusted certificate authority are numerous; a significant list is provided by Schneier. The trusted authority is also a single point of failure and attack, however, multiple redundant authorities may be used (e.g., as by Zhou and Haas [2]). **Spoofed Route Signalling:** Since only the source node can sign with its own private key, nodes cannot spoof other nodes in route instantiation. Similarly, reply packets include the destination node's certificate and signature, ensuring that only the destination can respond to route discovery. This prevents impersonation attacks where either the source or destination nodes is spoofed.

Fabricated Routing Messages: Messages can be fabricated only by nodes with certificates. In that case, ARAN does not prevent fabrication of routing messages, but it does offer a deterrent by ensuring non-repudiation. A node that continues to inject false messages into the network may be excluded from future route computation.

Alteration of Routing Messages: ARAN specifies that all fields of RDP and REP packets remain unchanged between source and destination. Since both packet types are signed by the initiating node, any alterations in transit would be immediately detected by intermediary nodes along the path, and the altered packet would be subsequently discarded. Repeated instances of altering packets could cause other nodes to exclude the errant node from routing, though that possibility is not considered here. Thus, modification attacks are prevented.

Securing Shortest Paths: We believe there is no way to guarantee that one path is shorter than another in terms of hop count. Tunnelling attacks are possible in ARAN as they are in any secure routing protocol. Securing a shortest path cannot be done by any means

except by physical metrics such as a timestamp in routing messages. Accordingly, ARAN does not guarantee a shortest path, but offers a quickest path which is chosen by the RDP that reaches the destination first. Malicious nodes do have the opportunity in ARAN to lengthen the measured time of a path by delaying REPs as they propagate, in the worst case by dropping REPs, as well as delaying routing after path instantiation. Finally, malicious nodes using ARAN could also conspire to elongate all routes but one, forcing the source and destination to pick the unaltered route; clearly, a difficult task.

Replay Attacks: Replay attacks are prevented by including a nonce and a timestamp with routing messages.

5.3. SAODV

SAODV proposed by M.G. Zapata, and N. Asokan [9] in 2002. Let's assume that there is a key management sub-system that makes it possible for each ad hoc node to obtain public keys from the other nodes of the network. Further, each ad hoc node is capable of securely verifying the association between the identity of a given ad hoc node and the public key of that node. How this is achieved depends on the key management scheme.

Two mechanisms are used to secure the AODV messages: digital signatures to authenticate then on-mutable fields of the messages, and hash chains to secure the hop count information (the only mutable information in the messages). For the non-mutable information, authentication is performing in an end-to-end manner, but the same kind of techniques cannot be applied to the mutable information. The information relative to the hash chains and the signatures is transmitted with the AODV message as an extension message that we will refer to as Signature Extension.

SAODV avoids active external attacks by not forwarding route requests to the external nodes. This is done by authenticating all the nodes of the network. In the implementation carried out here the authentication of a node is determined by its password. Here all the nodes of the network are assigned the same password. Hence before forwarding route request to a neighbor, a node first checks the authenticity of the neighbouring node by verifying its password. If it is found legal, then only route request is forwarded. In this way, external nodes are excluded from entry into the network. The problem of route table overflow is solved by updating the tables at regular intervals of 70ms. SAODV solves the problem of black hole by disabling the intermediate nodes to send route replies and thereby allowing the generation of route reply only by the destination node. After receiving route reply from an intermediate node, the originator sends an enquiry to check whether a route from that intermediate node to the destination node exists or not. If it exists, the originator trusts the intermediate node and sends out the data packets via this intermediate node. If not, the originator simply discards the reply message from the intermediate node, sends out alarm message to the network, isolates that intermediate node from the network and starts a new route discovery process. No malicious node can read the data in the data packet due to the encryption of the message. Every node checks

password before forwarding the RREQ. All nodes on the route from source to destination are secure and fulfil security requirements of the sender.

5.4. SAR

There is another approach to secure the ad hoc routing protocol motivated from traditional wired routing matrices where same security levels of nodes incorporate each other [13]. Instead of discovering the shortest path between two nodes, Security Aware Ad Hoc Routing (SAR) protocol can discover a path with desired security attributes, such as a path through nodes a particular shared key. For this purpose to determining a secure route, the information in the routing messages must be protected against alteration that can change routing behavior. A node initiating route discovery determines the required minimal trust level for nodes participating in the query and reply propagation. Since only nodes at each trust level share symmetric encryption keys, intermediate nodes of different levels cannot decrypt in-transit routing packets or determine whether the required security attributes can be satisfied and drop them. Only the nodes with the correct key can read the header and forward the packet. So if a packet has reached the destination, it must have been propagated by nodes at the same level. Therefore Routes discovered by SAR come with “quality of protection” guarantees.

One of the merits SAR has is that it can be implemented based on any on-demand ad hoc routing protocol with suitable modification [13]. The security metric can be embedded into RREQ packet. It also showed the practical implementation and experimental data by mixing with AODV [14]. Drawback of SAR Although SAR scheme provides protection of the routing protocol traffic; it does not eliminate false routing information provided by malicious nodes. Moreover, the assumed supervising organization and the fixed assignment of trust levels do not pertain to the ad hoc paradigm. And SAR has also a lot of encryption overhead, since each intermediate node has to perform it.

5.5. SRP

SRP focus on bi-directional communication between a pair of nodes. A *security association (SA)* between the *source node S* and the *destination node T* is assumed. The trust relationship could be instantiated, for example, by the knowledge of the public key of the other communicating end. The two nodes can negotiate a shared secret key, e.g., via the Elliptic Curve Diffie-Hellman algorithm [12], and then, using the SA, verify that the principal that participated in the exchange was indeed the trusted node. For the rest of the discussion, we assume the existence of a shared key KS,T . The SA is bi-directional in that the shared key can be used for control (data) traffic flow in both directions. Relevant state has to be maintained for each direction though.

SRP makes efficient use of the security association between the two communicating nodes *S* and *T*. Route request packets verifiably propagate to the destination (in the general case) and route replies are returned to *S* strictly over the reversed route, as accumulated in the route request packet. Similarly, route error messages can only be generated by nodes that lie on the route that is reported as broken. In order to guarantee

this functionality of crucial importance, *SRP* determines explicitly the interaction with the network layer; i.e., the *IP*-related functionality. Furthermore, it provides a novel way of query identification, which protects the query propagation and the end-nodes from *DoS* attacks. Finally, propagating query packets are handled locally by a *priority scheme* that enhances the robustness and the responsiveness of the protocol.

This figure shows *SRP* as an extension of a reactive routing protocol: the *SRP* header is appended to the basis routing protocol header.

SRP consists of several security extensions that can be applied to existing ad hoc routing protocols providing end-to-end authentication. The operational requirement of *SRP* is the existence of a security association between every source and destination node. The security association is used to establish a shared secret between the two nodes, and the non-mutable fields of the exchanged routing messages are protected by this shared secret.

IP Header
Basis Routing Protocol Packet
SRP Header

Table 1: Defense against attacks.

Protocols	Location disclosure	Black hole	Replay	Attacks		
				Wormhole	Denial-of-service	Routing table poisoning
ARAN	NO	NO	YES	NO	NO	YES
SAODV	NO	NO	YES	NO	NO	YES
SAR	NO	NO	YES	NO	NO	YES
SRP	NO	NO	YES	NO	YES	YES

6. Conclusion

Secure Routing is one of the most basic and important tasks in a collaborative computer network. This review presented the security flaws of AODV and routing protocols which provide security over the AODV. However, a difficult problem is how to guarantee these desirable properties. Neither simulations nor testbed implementations can ensure the quality required for these protocols. As an alternative to these methods, some researchers have successfully investigated the use of formal verification as a mean to guarantee the quality of routing protocols. Formal verification is a technique that assures a system has, or has not, a given property, based on a formal specification of the system under evaluation. We conclude that more work is needed towards a formal model based on solid mathematical grounds that can precisely give a definition for secure ad hoc routing. This will allow researchers to formally prove whether a proposed protocol satisfies the definition under certain assumptions and will make the comparison between the properties of each proposal an easier and well- structured process.

7. REFERENCES

- [1] Das S. Perkins C.E., Belding-Royer E.M. Ad-hoc on-demand distance vector (aodv) routing. RFC 3561, IETF Network Working Group, 2003.
- [2] L. Zhou and Z. J. Haas. Securing ad hoc networks. IEEE Network Magazine, 13(6):24–30, November/December 1999.
- [3] S. Marti, T. J. Giuli, K. Lai, and M. Baker. Mitigating routing misbehavior in mobile ad hoc networks. In Proceedings of the Sixth Annual International Conference on Mobile Computing and Networking, pages 255–265, 2000.
- [4] K. Sanzgiri, B. Dahill, B.N. Levine, C. Shields and E.M. Royer, “A Secure Routing Protocol for Ad hoc Networks”, *Proc. 10th IEEE Int’l. Conf. Network Protocols (ICNP’02)*, IEEE Press, 2002, pp. 78-87.
- [5] J.-P. HuBaux, L. Buttyan, and S. Capkun. The quest for security in mobile ad hoc networks. In Proc. ACM MOBICOM, Oct. 2001.
- [6] J. Kong et al. Providing robust and ubiquitous security support for mobile ad-hoc networks. In Proc. IEEE ICNP, pages 251–260, 2001.
- [7] S. Yi, P. Naldurg, and R. Kravets. Security-aware ad hoc routing for wireless networks. In Proc. ACM Mobihoc, 2001.
- [8] P. Papadimitratos and Z. J. Haas. Secure routing for mobile ad hoc networks. SCS Communication Networks and Distributed Systems Modeling and Simulation Conference (CNDS 2002), Jan 2002.
- [9] M.G. Zapata, and N. Asokan, “Secure Ad hoc On-Demand Distance Vector Routing,” *ACM Mobile Computing and Communications Review*, vol. 3, no. 6, July 2002, pp. 106-10
- [10] Mitchell, J. C., Mitchell, M., Stern, U. : Automated Analysis of Cryptographic Protocols Using Murphi. IEEE Symposium on Security and Privacy. (1997) 141–151
- [11] Dolev, D., Yao, A.C.: On the security of public key protocols. IEEE Transactions on Information Theory. 29(12) (1983) 198–208
- [12] W. Diffie, M.E. Hellman, “New directions in cryptography,” IEEE Transactions in Information Theory, 1976.
- [13] Zheng Yan, “Security in Ad Hoc Networks”, Networking Laboratory, Helsinki University of Technology, 2001.
- [14] S. Yi, P. Naldurg, and R. Kravets. Security-aware ad-hoc routing for wireless networks. Technical Report UIUCDCS-R-2001-2241, University of Illinois at Urbana-Champaign, August 2001.